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(54) PORTABLE TOILET CHEMICAL RECHARGE PUMPING SYSTEM

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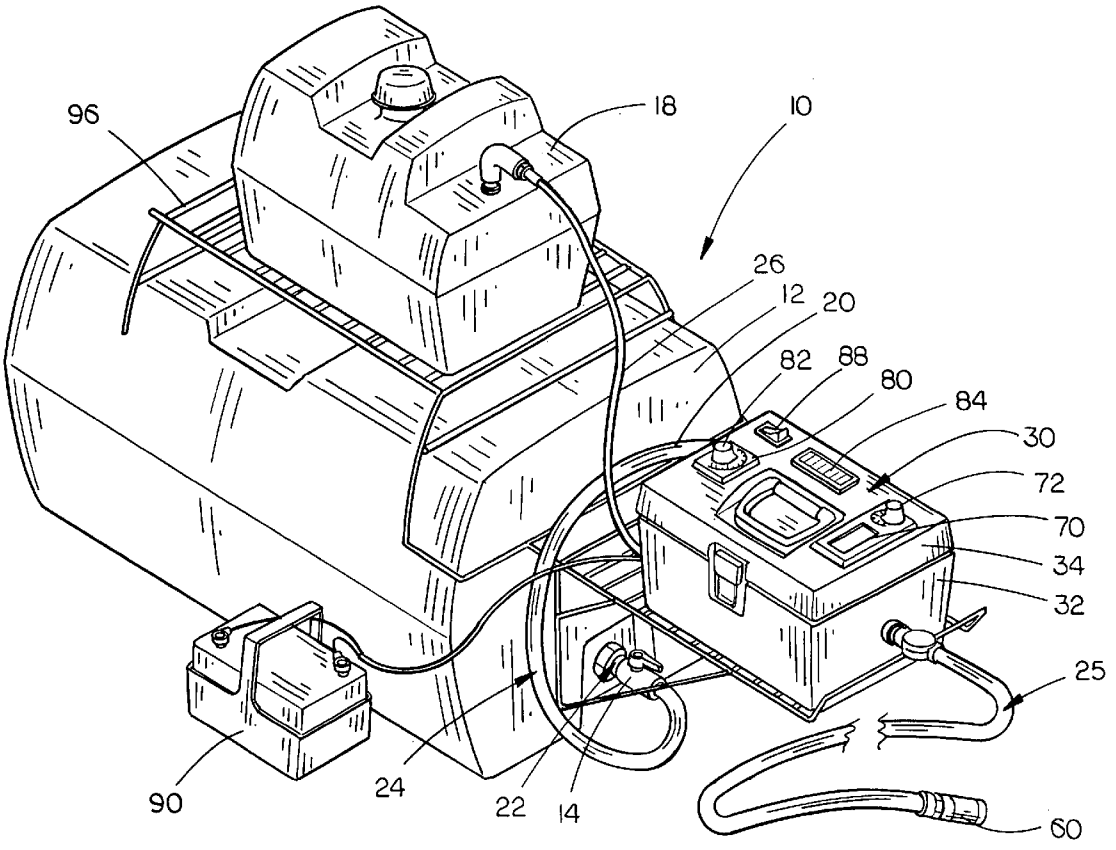
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(57) **ABSTRACT**

A portable toilet chemical recharge pumping system includes a water source and a main conduit with a water pump, and a liquid chemical solution source with a chemical conduit and a chemical pump, the chemical conduit connected to the main conduit below the water pump. A water pump timer and a chemical pump timer each engage and disengage the water and chemical pumps, and a chemical flow control valve controls chemical flow through the chemical conduit. An anti-siphon valve on the end of the main conduit prevents unintentional liquid flow, and the water and chemical pump timers and the chemical flow control valve control liquid flow through the main and chemical conduits to provide a pre-injection water flush period, a liquid chemical injection period wherein liquid chemical flows into the main conduit, and a post-injection water flush period wherein water continues to flow out of the anti-siphon valve.



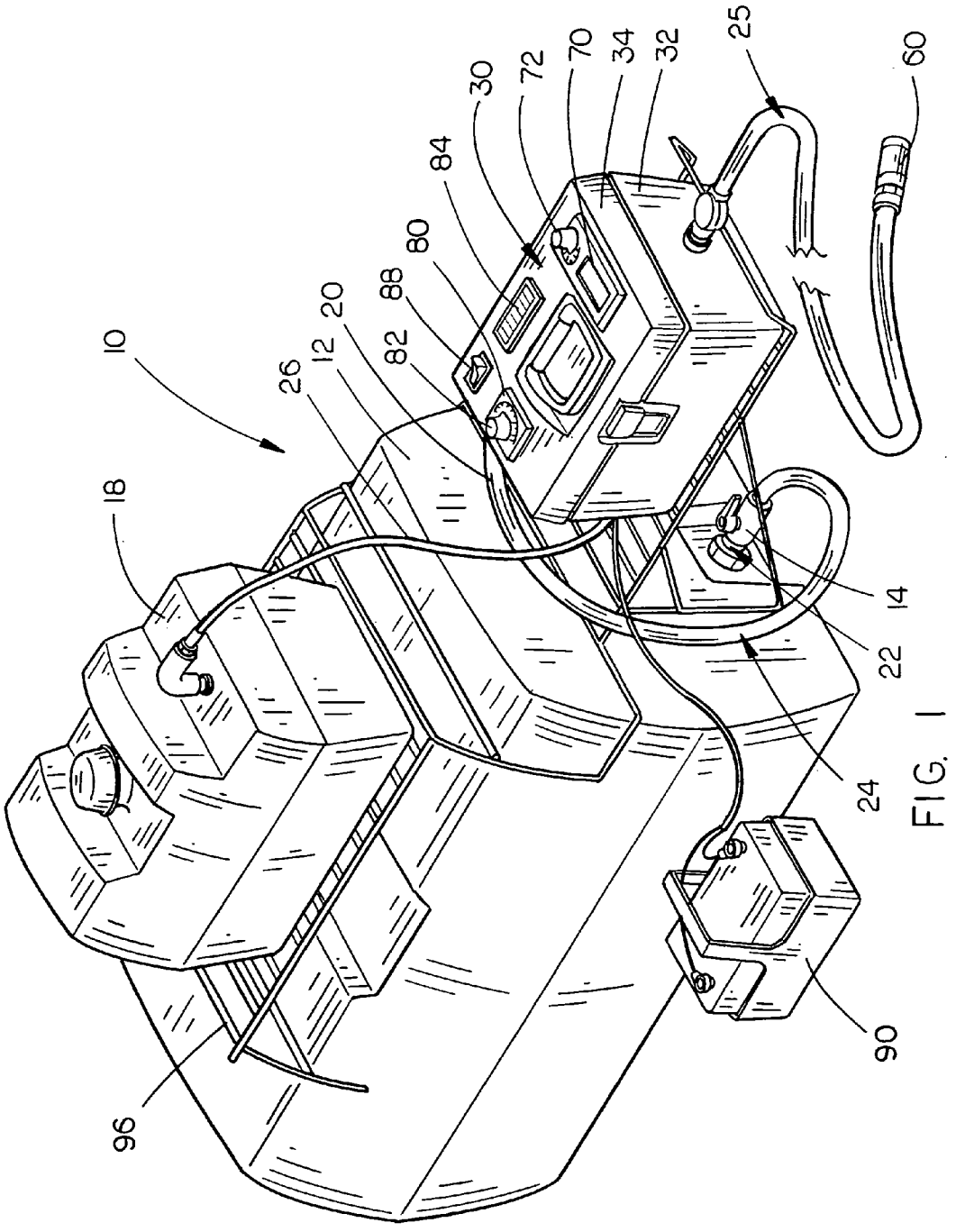


FIG. 1

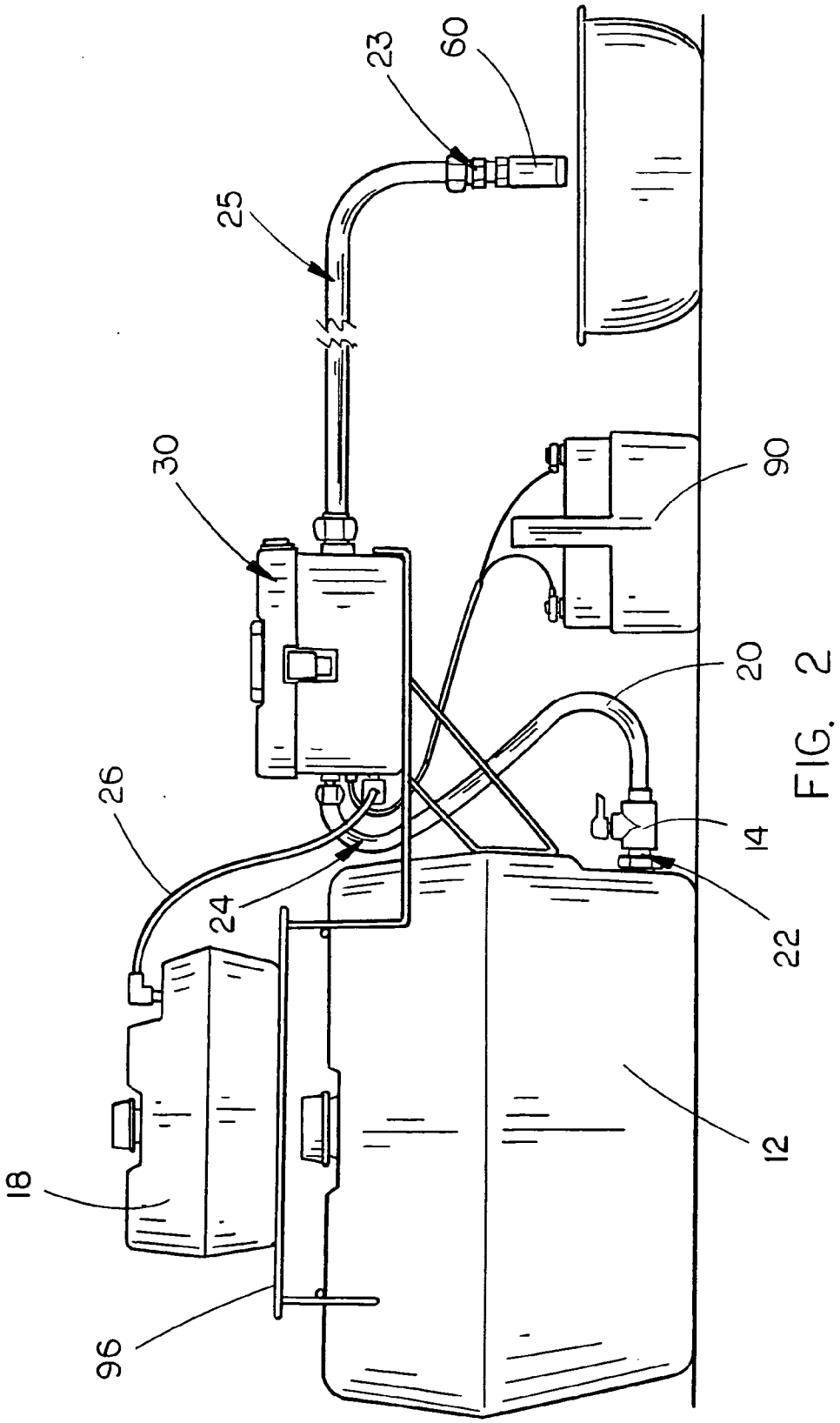


FIG. 2

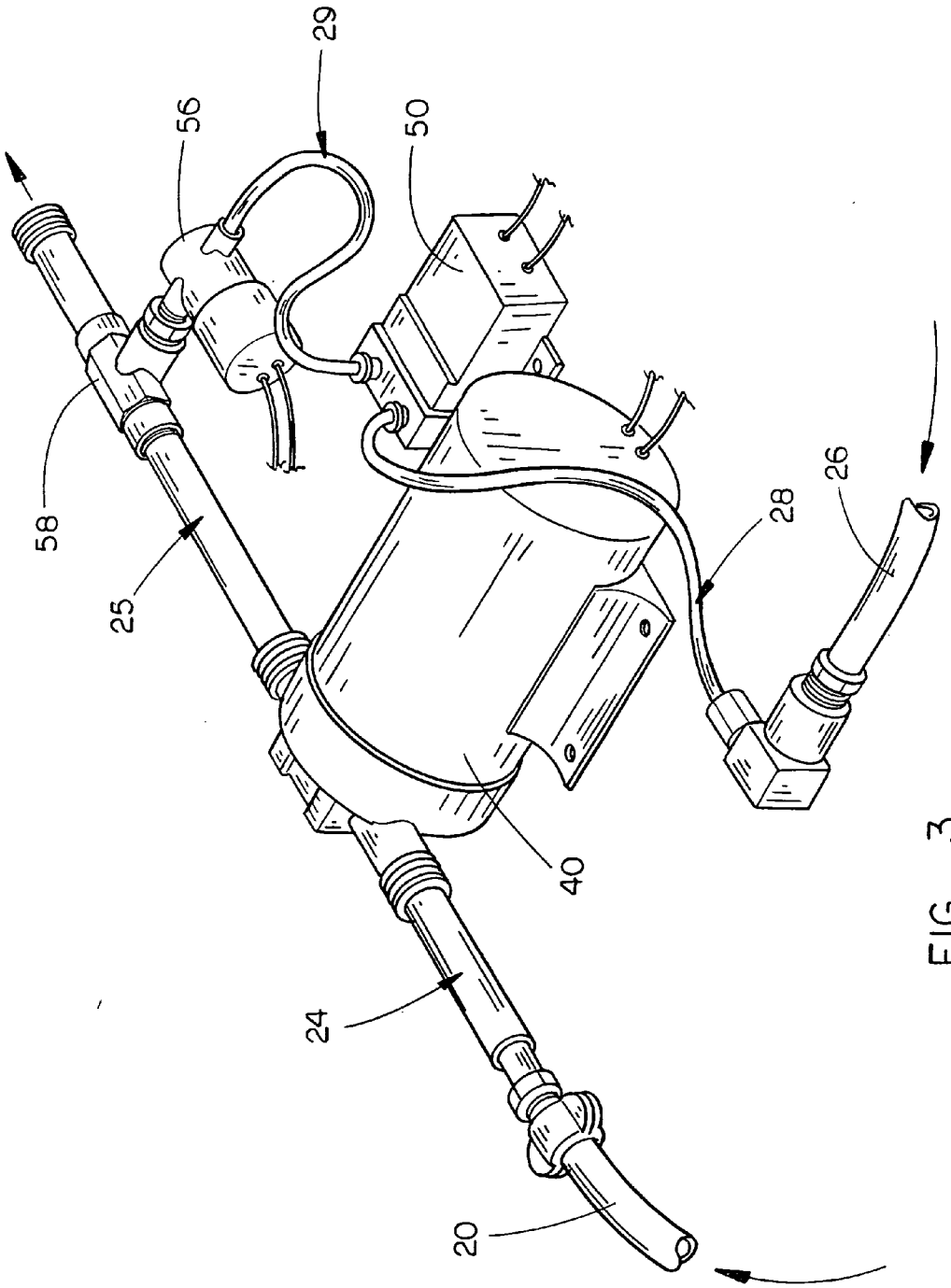


FIG. 3

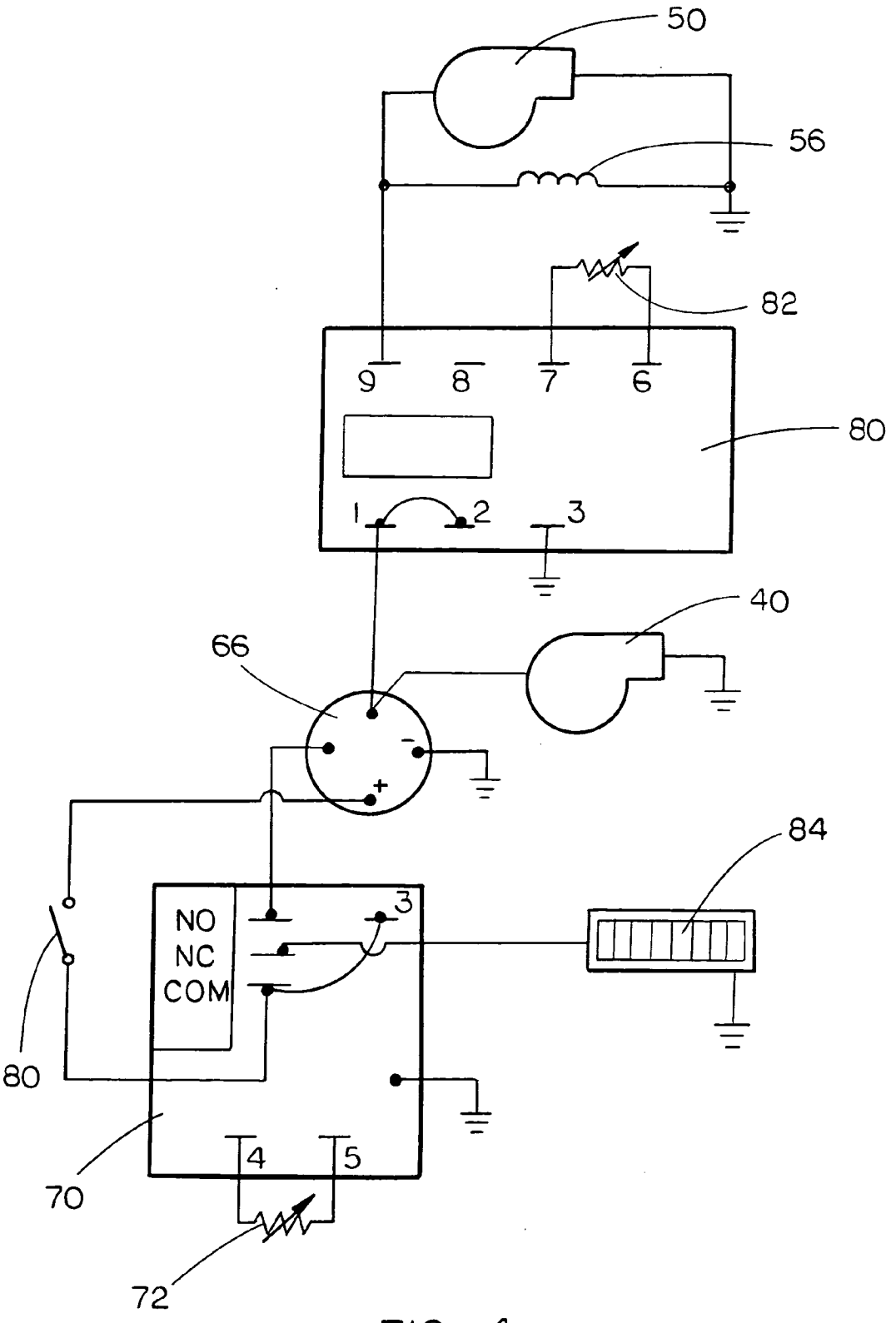


FIG. 4

PORTABLE TOILET CHEMICAL RECHARGE PUMPING SYSTEM

BACKGROUND OF THE INVENTION

[0001] 1. Technical Field

[0002] The present invention is directed to portable chemical toilet recharge systems and, more particularly, to a portable toilet chemical recharge pumping system which includes a main conduit connected to a water source, a chemical conduit connected to a liquid chemical source, a water pump interposed in the main conduit between the inflow and outflow ends thereof, a chemical pump interposed in the chemical conduit, the outflow end of the chemical conduit connecting to the main conduit downstream of the water pump, a water pump timer operatively connected to the water pump, a chemical pump timer operatively connected to the chemical pump, a chemical flow control valve operatively connected to the chemical conduit downstream of the chemical pump for controlling flow of liquid chemicals therethrough, an anti-siphon valve mounted on the outflow end of the main conduit to prevent fluid flow out of the outflow end when the fluid flow force falls below a predetermined level, and the water pump timer, chemical pump timer, and chemical flow control valve operative to control liquid flow through the main conduit and chemical conduit with the water pump timer initiating operation of the water pump for a predetermined pre-injection water flush period, the chemical pump timer initiating operation of the chemical pump and opening the chemical flow control valve for a predetermined liquid chemical injection period where liquid chemical flows through the chemical conduit into the main conduit to mix with the water in the main conduit, the chemical pump timer operative to close the chemical flow control valve and disengage the chemical pump upon a specified amount of liquid chemical being added to the water flow through the main conduit, and the water pump timer operative to disengage operation of the water pump following a predetermined post-injection water flush period wherein water flows through the main conduit out of the anti-siphon valve, the anti-siphon valve operative to prevent fluid flow out of the outflow end of the main conduit when the water pump is disengaged.

[0003] 2. Description of the Prior Art

[0004] The portable toilet industry generally requires a water and chemical recharging mixture to be used in the base of the portable toilet to control odor and prevent bacterial growth between servicing periods. There are many different types of chemicals which are used in connection with portable chemical toilets, but generally the chemicals are selected from formaldehyde, methanol, glycol, or magnesium chloride-based solutions which are quite toxic and potentially hazardous, but which are necessary in order to provide the level of bacterial control and odor masking required by the portable chemical toilet industry. In general, the recharge of a portable chemical toilet involves mixing the chemicals with water in an appropriate container and then manually adding the chemical/water mixture to the portable chemical toilet. The clear disadvantage of such a process, however, is that it affords numerous opportunities for the chemical to contact the skin or eyes of the user, and due to the powerful nature of the chemicals, such contact with the skin and/or eyes can cause significant and possibly severe damage. There is therefore a need for a portable chemical toilet recharge system which will generally eliminate the risks involved in servicing and recharging chemical toilets while simultaneously providing a simple and efficient system by which recharging may be performed.

[0005] There are a few examples found in the prior art which attempt to address and solve this problem, including such devices as that found in Mullett, et al., U.S. Patent Application 2005/0241055, and Tumminia, U.S. Pat. No. 5,429,270. Of these, the Mullett invention is likely the most closely related to the intended function of the present invention, as it discloses a portable toilet charging system which includes a water source, a chemical additive container, and a control valve for providing chemical additive to the flush water used in a portable chemical toilet. However, Mullett is intended primarily to periodically refresh the chemical toilet but is not intended to recharge the system, which requires a pumping system and control system which addresses the significant quantities of chemicals and water which must be added to the portable chemical toilet during the recharge process. There is therefore needed a portable toilet chemical recharge pumping system which is designed to facilitate recharging of portable chemical toilets and does so in a safe and efficient manner.

[0006] Therefore, an object of the present invention is to provide an improved portable toilet chemical recharge pumping system.

[0007] Another object of the present invention is to provide a portable toilet chemical recharge pumping system which is designed to generally prevent unintended discharge of chemicals and/or water and chemical mixtures from the device when the device is inoperative, as sometimes occurs with unintended post-operational siphoning from the hoses used in some devices.

[0008] Another object of the present invention is to provide a portable toilet chemical recharge pumping system which includes a water pump, a chemical pump, a water pump timer, a chemical pump timer, and a chemical flow control valve which all cooperate to control and regulate chemical and water flow into a portable chemical toilet being recharged by operation of the present invention.

[0009] Another object of the present invention is to provide a portable toilet chemical recharge pumping system in which the water pump is initiated for a predetermined pre-injection water flush period for flushing of the main conduit, the chemical pump timer initiates operation of the chemical pump and chemical flow control valve for a predetermined liquid chemical injection period where liquid chemical flows through the chemical conduit into the main conduit and the water pump timer continues to operate the water pump after the chemical pump ceases operating to flush the remaining chemical out of the system and complete the recharge process with the correct selected amount of water to mix with the chemical.

[0010] Another object of the present invention is to provide a portable toilet chemical recharge pumping system which is capable of being operated in a hands-free mode where the operator need not mix the chemicals or manually add the chemicals to the portable chemical toilet being recharged as the system will perform all of those operations for the user.

[0011] Finally, an object of the present invention is to provide a portable toilet chemical recharge pumping system

which is relatively simple and durable in construction and is safe, effective and efficient in use.

SUMMARY OF THE INVENTION

[0012] The present invention provides a portable toilet chemical recharge pumping system including a water source and a main conduit in liquid transmission connection with the water source at the inflow end thereof, the main conduit including a first main conduit section and a second main conduit section. A water pump is interposed between the first and second main conduit sections of the main conduit operative to draw water from the water source through the first main conduit section and force water onwards through the second main conduit section. A liquid chemical solution source is connected in liquid transmission connection with a chemical conduit which includes a first chemical conduit section and a second chemical conduit section, and a chemical pump is interposed between the first and second chemical conduit sections of the chemical conduit and is operative to draw liquid chemical from the liquid chemical solution source through the first chemical conduit section and force liquid chemical onwards through the second chemical conduit section. The second chemical conduit section is connected in liquid chemical solution transmission to the second main conduit section whereby liquid chemical is added to the water flowing through the second main conduit section. A water pump timer is operative to engage and disengage the water pump and a chemical pump timer is operative to engage and disengage the chemical pump. Also, a chemical flow control valve is operatively connected to the second chemical conduit section for controlling flow of liquid chemical through the second chemical conduit section. An anti-siphon valve is mounted on the main conduit at the outflow end of the main conduit, the anti-siphon valve operative to prevent fluid flow out of the outflow end of the main conduit when fluid flow force drops below a predetermined amount. Finally, the water pump timer, the chemical pump timer and the chemical flow control valve are cooperatively operative to control liquid flow through the main conduit and the chemical conduit with the water pump timer initiating operation of the water pump for a predetermined pre-injection water flush period wherein water flows through the main conduit, the chemical pump timer initiating operation of the chemical pump and opening of the chemical flow control valve for a predetermined liquid chemical injection period wherein liquid chemical flows through the chemical conduit through the chemical flow control valve into the main conduit to mix with the water such that the resulting water/chemical mixture flows through the anti-siphon valve out of the outflow end of the main conduit, the chemical pump timer operative to close the chemical flow control valve and disengage the chemical pump upon a specified amount of liquid chemical being added to the water flow through the main conduit, the water pump timer disengaging operation of the water pump following a predetermined post-injection water flush period wherein water flows through the main conduit out of the anti-siphon valve, the anti-siphon valve operative to prevent fluid flow out of the outflow end of the main conduit when the water pump is disengaged.

[0013] The present invention as thus described provides many improvements over those recharging devices and systems found in the prior art. For example, because of the anti-siphon valve affixed to the outflow end of the main conduit, accidental discharge of chemicals or the chemical/water mixture is generally prevented, thus making the recharging process far safer. Also, because the present invention provides both a pre-injection water flush period and a post-injection water flush period, it is highly unlikely that the chemical will be directed anywhere but in the intended location, namely, the portable chemical toilet being recharged. Finally, because the system of the present invention automatically combines the chemical with the water and delivers the desired mixed product to the portable chemical toilet through an easily directed and controlled hose having an anti-siphon check valve on the end thereof, it is believed that no special training or practice with the operation of the present invention will be necessary for a user to properly recharge a portable chemical toilet through use of the present invention. It is therefore seen that the present invention provides a substantial improvement over those devices and systems found in the prior art which attempt to perform a similar function.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] FIG. **1** is a perspective view of the portable toilet chemical recharge pumping system of the present invention;

[0015] FIG. **2** is a side elevational view of the present invention showing the operative elements thereof;

[0016] FIG. **3** is a detailed perspective view of the pumping system of the present invention showing the operative elements of the pumping system; and

[0017] FIG. **4** is an electrical schematic diagram of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0018] The portable toilet chemical recharge pumping system **10** of the present invention is shown best in FIGS. **1-4** as including a water reservoir **12** and a chemical reservoir **18**, with the water reservoir **12** being of any appropriate size, shape and design, although it is expected that a large plastic or metal tank will be used for the water reservoir **12** of the present invention. Likewise, the chemical reservoir **18** may be or any desired size, shape or design, so long as the chemicals held within the chemical reservoir **18** are safely and securely retained therein until released into the pumping system **10** of the present invention. In fact, in many instances, the water reservoir **12** and chemical reservoir **18** would be carried on a vehicle such as a truck to provide a portable recharging system in accordance with the present invention as described below, although such usage is not particularly critical to the present invention.

[0019] Extending outwards from water reservoir **12** and in liquid transmission connection therewith is a main conduit **20** which, in the preferred embodiment, would be a hose or tube which is connected to the water reservoir **12** via a valve **14** fitted on the inflow end **22** of main conduit **20**, as shown best in FIG. **2**. The main conduit **20** would extend to the main pump housing **30** in which all of the various timers and pumps are housed as will be described later in this disclosure. The key requirement for the main conduit **20** is that it provides a steady and unimpeded flow of water from the water reservoir **12**, and otherwise the size, shape and construction material used in connection with main conduit **20** is not critical to the present invention. For clarification purposes, it should be noted that the section of main conduit **20** which extends between the water reservoir **12** and main pump housing **30** will be referred to as the first main conduit section **24**.

[0020] Likewise, the chemical reservoir **18** is connected to the main pump housing **30** via a chemical conduit **26** which, in the preferred embodiment, would be a tube or hose of narrower diameter than that used in connection with main conduit **20** and would generally be constructed of a chemically non-reactive material to ensure that the chemical being transferred between the chemical reservoir **18** and main pump housing **30** will not be accidentally released. For clarification purposes, the section of the chemical conduit **26** which extends between the chemical reservoir **18** and main pump housing **30** will be referred to as the first chemical conduit section **28**.

[0021] When the main conduit **20** and chemical conduit **26** enter the main pump housing **30**, they encounter the pumping and control mechanisms which drive the pumping system **10** of the present invention. Specifically, these are best shown in FIG. **3** as including a water pump **40** which is preferably a standard 12-volt pump which may have various pumping capacities associated with it, depending on the desired speed and flow amount of water through the main conduit **20**. As shown best in FIG. **3**, the water pump **40** is interposed between the first main conduit section **24** and second main conduit section **25** of main conduit **20** such that water from the water reservoir **12** is drawn through the first main conduit section **24** and propelled through and past the water pump **40** into the second main conduit section **25** of main conduit **20** and out of the main pump housing **30**. It should be noted that the main pump housing **30** may be of virtually any size, shape and construction material, although it has been found that a molded plastic rectangular box **32** having a hinged lid **34** mounted thereon provides an easily portable yet highly protective enclosure for the pumping and control mechanisms of the present invention.

[0022] The chemical conduit **26**, specifically first chemical conduit section **28**, feeds into the main pump housing **30** and proceeds to chemical pump **50** which is likely mounted adjacent the water pump **40** yet, of course, may be moved to any position within the main pump housing **30** as desired by the manufacturer and/or user of the present invention. In the preferred embodiment, the chemical pump **50** would be a standard 12-volt pump design which is operative to draw the chemical out of the chemical reservoir **18** through first chemical conduit section **28** of chemical conduit **26** and force the chemical solution through the second chemical conduit section **29** of chemical conduit **26** which extends forwards and downstream from the chemical pump **50**. The important consideration with chemical pump **50** from an operational standpoint is that the chemical pump **50** needs to output a steady measurable flow of the chemical solution so that the proper amount of chemical solution may be combined with the water flowing through main conduit **20** as will be described herein. Therefore, the precise size, shape and design of chemical pump **50** is not particularly critical to the present invention so long as the chemical pump **50** functions to provide the steady measurable flow of chemical solution therefrom.

[0023] The second chemical conduit section **29** feeds out from the chemical pump **50** into a solenoid valve **56** which, in the preferred embodiment, would function to precisely control flow of the chemical solution through the chemical conduit **26** into the main conduit **20** at the point where the second chemical conduit section **29** of chemical conduit **26** connects with the second main conduit section **25** of main conduit **20** at the T-joint **58** adjacent solenoid valve **56**. The resulting chemical/water mixture would then flow through the second main conduit section **25** of main conduit **20** out of the main pump housing **30**, as shown best in FIGS. **1** and **2**.

[0024] It should be noted that it is preferred that fresh water be used in connection with the present invention. Furthermore, the chemical used in connection with the present invention would preferably be a formaldehyde, methanol, glycol, or magnesium chloride-based liquid solution which is designed to provide the level of bacterial control and odor masking required by the portable chemical toilet industry. The particular chemicals to be used in specific situations would be understood by one skilled in the art of portable chemical toilets, and therefore further discussion of the specific nature of the chemicals used in connection with the present invention will not be discussed further in this disclosure.

[0025] Mounted on the outflow end **23** of main conduit **20** is an anti-siphon check valve **60** which, in the preferred embodiment, would be a standard type of anti-siphoning check valve which would prevent outflow of the water or water/chemical mixture from the main conduit **20** unless the water pump **40** were operating to force the water or water/chemical mixture through the main conduit **20** at a sufficient flow rate and flow force to force open the anti-siphon check valve **60**. The primary purpose for the anti-siphon check valve **60** is to prevent siphoning of the liquid contents of the second main conduit section **25** when the water pump **40** ceases operating, as this ensures that accurate calculation of the total amount of liquid (both water and chemical) which is being transferred to the chemical toilet being recharged. Of course, the precise type of anti-siphon check valve **60** which is used in the present invention is not critical so long as it performs the intended function of preventing siphoning of the liquid contents of the second main conduit section **25** upon stopping of water pump **40**.

[0026] Operation of the water pump **40**, chemical pump **50**, and solenoid valve **56** is controlled by a pair of electronic timing devices, specifically a water pump timer **70** and a chemical pump timer **80** which are connected in electronic information transmission connection with the water pump **40**, chemical pump **50**, and solenoid valve **56**, as shown best in FIG. **4**. In the preferred embodiment, the water pump timer **70** and chemical pump timer **80** would each be electronic timing devices which function as standard electronic timers and are connected to a power source **90** which, in the preferred embodiment, would be a 12-volt battery or the like, as has been found that a 12-volt battery provides sufficient electrical power for functioning of the present invention. Of course, however, other sources of electrical power may be used in connection with the present invention so long as the proper operating voltages and amperages are provided to the various elements of the present invention to permit them to function as intended.

[0027] As shown best in FIG. **1**, the water pump timer **70** and chemical pump timer **80** would be mounted in the plastic box **32** of main pump housing **30**, either in the lid **34** or in a top tray mounted within the main pump housing **30**, to provide easy access to the water pump timer **70** and chemical pump timer **80** while simultaneously mounting them in the protected location within the main pump housing **30**. It should be noted, however, that FIG. **1** illustrates the water pump timer **70** and chemical pump timer **80** being mounted in the lid **34** of plastic box **32** of main pump housing **30** so that those elements may be more easily viewed. Because the water pump **40** and chemical pump **50** each pump their respective liquid at

a fixed rate, the water pump timer **70** and chemical pump timer **80** may turn the water pump **40** and chemical pump **50** on and off to control the amount of liquid, be it water or chemical, which is being sent through the second main conduit section **25** through anti-siphon check valve **60** and into the chemical toilet being recharged. Specifically, the adjustment dial **72** on water pump **70** may be adjusted, in the preferred embodiment, for delivery of as little as one gallon to as much as seven gallons per recharge cycle, merely by adjusting the settings of adjustment dial **72** which controls the duration of time between which the water pump timer **70** engages and disengages water pump **40**. Likewise, the adjustment dial **82** on chemical pump timer **80** may be adjusted such that anywhere from as little as one ounce of chemical to as much as ten ounces of chemical may be added to the water flow through main conduit **20** by adjusting the duration of the engagement time of chemical pump **50** via the chemical pump timer **80**. Of course, both the water pump timer **70** and chemical pump timer **80** would function in a similar manner in that current flow to the water pump **40** and chemical pump **50** respectively, would be controlled via the water pump timer **70** and chemical pump timer **80**, thereby disengaging or engaging the water pump **40** and chemical pump **50** when the timer is operational.

[0028] It should also be noted, however, that the chemical pump timer **80** is operatively connected to the solenoid valve **56**, to control the opening and closing of solenoid valve **56** by operation of the chemical timer **80**. Specifically, when the chemical pump timer **80** engages the chemical pump **50**, it also opens solenoid valve **56** to permit chemical to flow through the chemical conduit **26**, specifically through second chemical conduit section **29** towards the T-joint **58** and into the main conduit **20**. When the chemical pump timer **80** shuts off the chemical pump **50**, it simultaneously shuts the solenoid valve **56** thereby accurately controlling the amount of chemical being injected into the main conduit **20**, specifically into the water flow within main conduit **20** which leads to the anti-siphon check valve **60** and into the chemical toilet being recharged. The primary purpose for solenoid valve **56** is to completely prevent addition of chemical to the water flowing through main conduit **20** once the chemical pump timer **80** disengages the chemical pump **50**, although it should be noted that other types of valves may be substituted for the solenoid valve **56** as described herein so long as the intended function of preventing unintended addition of chemical to the water flow is maintained.

[0029] Another important feature of the present invention is the inclusion of a solenoid switch **66** which is shown best in FIG. **4** as being operatively connected to both the water pump timer **70** and chemical pump timer **80** and to the power switch **88** and which is designed to perform the following functions. The solenoid switch **66** would preferably be of a standard commercially-available type which would engage both the water pump timer **70** and chemical pump timer **80** simultaneously when the power switch **88** is engaged, thereby ensuring that accurate and correct timer settings are maintained and not thrown off due to delays in initiating the timers themselves. Also, it has been found that the solenoid switch **66** permits the position of the power switch **88** relative to the main pump housing **30** to be changed without creating a significant voltage drop. Specifically, the power switch **88** may be positioned adjacent the outflow end **23** of main conduit **20** in order to facilitate operation of the device, and as the outflow end **23** may be forty to fifty (40 to 50) feet from the main pump housing **30**, particularly when the present invention is mounted on a vehicle, that length of wire will produce a significant voltage drop without the presence of the solenoid switch **66** in the electrical circuit. Finally, an additional benefit of the present invention is that should the user of the present invention forget to disengage the power switch **88**, the solenoid switch **66** will prevent further operation of the invention once the two timers have timed out, thus adding another level of safety to the present invention.

[0030] In the preferred embodiment, the portable toilet chemical recharge pumping system **10** of the present invention would function in the following manner. The operator would initially set the adjustment dials **72** and **82** of the water pump timer **70** and chemical pump timer **80** to the desired settings so that the correct amount of water and chemical are added to the portable chemical toilet being recharged. For example, a standard setting for adjustment dial **72** and water pump timer **70** would be for approximately five gallons of water to be injected per cycle, and a similar setting for the chemical pump timer **80** would be to set the adjustment dial **82** such that approximately five ounces of chemical would be added to the water for injection into the portable chemical toilet being recharged. The portable toilet chemical recharge pumping system **10** would them be turned on via power switch **88** which permits power to flow to the solenoid switch **66** which is engaged and then sends power simultaneously to each of the timers found within the system, the power being fed from the power supply **90**. This then energizes the water pump timer **70** and chemical pump timer **80** which are activated to turn on the water pump **40** immediately or soon after activation of the system. A very important feature of the present invention is that a safety delay is programmed into the chemical pump timer **80** such that upon activation of the water pump timer **70**, an approximate five second delay occurs before the chemical pump timer **80** engages the chemical pump **50** and solenoid valve **56**. This permits fresh water to "flush" the main conduit **20** as the water is drawn from the reservoir **12** which ensures that any chemical residue remaining in the main conduit **20** is flushed clean prior to beginning of a new injection cycle and further permitting the operator to have a brief period of time in which he or she can stop operation of the system prior to release of any chemicals from the pumping system **10**. Because of the somewhat hazardous nature of the chemicals used in connection with the present invention, this safety delay which results in an approximately one to ten second pre-injection water flush period is an important feature of the invention, and such a delay is not found in connection with the prior art devices currently available.

[0031] After the safety delay, the chemical pump timer **80** engages the chemical pump **50** and solenoid valve **56** to inject chemical from the chemical reservoir **18** through chemical conduit **26** into the main conduit **20** at T-joint **58** in a predetermined liquid chemical injection period. Depending on the flow rate of chemical pump **50**, the injection period may be brief or somewhat extended so long as the intended injection of the preset amount determined by the adjustment dial **82** on chemical pump timer **80**. is the amount which is actually injected into the main conduit **20**. Once the chemical pump timer **80** times out, the chemical pump timer **80** sends a signal to chemical pump **50** and solenoid valve **56** which disengages chemical pump **50** and shuts solenoid valve **56** so that no more chemical may enter the main conduit **20**. However, water pump timer **70** continues to operate water pump **40** thus flushing the main conduit **20** until the delivery of the preset

amount of water is completed in a post-injection water flush period. At this point, the water pump timer **70** also times out and causes water pump **40** to disengage, thus stopping further injection of water into the chemical toilet being recharged. At the time the water pump **40** shuts down, the anti-siphon check valve **60** at the outflow end **23** of main conduit **20** prevents any further discharge of water or chemical from the main conduit **20** and at this point the pumping system **10** of the present invention deactivates as a further safety measure via disengagement of the solenoid switch **66**. Reactivation of the pumping system **10** occurs when the power switch **88** is turned off and then turned on again and the pumping system **10** is once again ready to inject a preset amount of water and chemical into a portable chemical toilet for recharge thereof.

[0032] It should be noted that numerous additions, modifications and substitutions may be made to the portable toilet chemical recharge pumping system **10** of the present invention which fall within the intended broad scope of the appended claims. For example, the size, shape, operational capabilities and functional characteristics of the elements of the present invention may be modified or changed so long as the intended function of the present invention is maintained, namely the facilitated recharging of chemical toilets. Also, it may be preferable to provide a mounting rack system **96** to support the various elements of the present invention in adjacent configuration as shown in FIGS. **1** and **2**, although the use of such a mounting rack system **96** is not critical to the present invention. Furthermore, the present invention preferably includes a cycle completion counter **84** which tracks the number of cycles which have been performed by the present invention, activation of which would be tied into not only the activation of the present invention, but specifically into the completion of each recharge cycle performed by the present invention, which is the more critical count, and the inclusion of such a cycle completion counter **84**, as shown in FIG. **4**, would be understood by one skilled in the art of such counting devices. It should also be noted that the present invention may be used to recharge both flushing and non-flushing portable chemical toilets, or may be used for other purposes beyond the recharging of toilets, should such uses become apparent to users of the present invention. Finally, although the functional elements of the present invention have been described with some particularity, the specific functionality of those elements is not as critical to the present invention as is the fact that the present invention requires a pre-flush for safety purposes in addition to a post-flush following injection of the chemical into the water flow, and the combination of the pre- and post-flushes is believed to provide a substantial improvement over those portable chemical toilet recharge systems shown in the prior art.

[0033] There has therefore been shown and described a portable toilet chemical recharge pumping system **10** which accomplishes at least all of its intended objectives.

I claim:

1. A portable toilet chemical recharge pumping system comprising:

a water source;

a main conduit in liquid transmission connection with said water source at the inflow end thereof, said main conduit including a first main conduit section and a second main conduit section;

a water pump interposed between said first and second main conduit sections of said main conduit operative to draw water from said water source through said first main conduit section and force water onwards through said second main conduit section;

a liquid chemical solution source;

a chemical conduit in liquid transmission connection with said liquid chemical solution source, said chemical conduit including a first chemical conduit section and a second chemical conduit section;

a chemical pump interposed between said first and second chemical conduit sections of said chemical conduit operative to draw liquid chemical from said liquid chemical solution source through said first chemical conduit section and force liquid chemical onwards through said second chemical conduit section;

said second chemical conduit section connected in liquid chemical solution transmission to said second main conduit section whereby liquid chemical is added to the water flowing through said second main conduit section;

a water pump timer operative to engage and disengage said water pump;

a chemical pump timer operative to engage and disengage said chemical pump;

a chemical flow control valve operatively connected to said second chemical conduit section for controlling flow of liquid chemical through said second chemical conduit section;

an anti-siphon valve mounted on said main conduit at an outflow end of said main conduit, said anti-siphon valve operative to prevent fluid flow out of said outflow end of said main conduit when fluid flow force drops below a predetermined amount; and

said water pump timer, said chemical pump timer and said chemical flow control valve operative to control liquid flow through said main conduit and said chemical conduit with said water pump timer initiating operation of said water pump for a predetermined pre-injection water flush period wherein water flows through said main conduit, said chemical pump timer initiating operation of said chemical pump and opening of said chemical flow control valve for a predetermined liquid chemical injection period wherein liquid chemical flows through said chemical conduit through said chemical flow control valve into said main conduit to mix with said water such that the resulting water/chemical mixture flows through said anti-siphon valve out of said outflow end of said main conduit, said chemical pump timer operative to close said chemical flow control valve and disengage said chemical pump upon a specified amount of liquid chemical being added to the water flow through said main conduit, said water pump timer disengaging operation of said water pump following a predetermined post-injection water flush period wherein water flows through said main conduit out of said anti-siphon valve, said anti-siphon valve operative to prevent fluid flow out of said outflow end of said main conduit when said water pump is disengaged.

2. The portable toilet chemical recharge pumping system of claim **1** further comprising a solenoid switch operatively interposed between an electrical power source and said water pump timer and said chemical pump timer for simultaneously engaging said water pump timer and said chemical pump timer by permitting electricity to flow to the timers upon said solenoid switch being engaged.

3. The portable toilet chemical recharge pumping system of claim **1** wherein said chemical flow control valve is a solenoid valve.

4. The portable toilet chemical recharge pumping system of claim **1** wherein said pre-injection water flush period is between one (1) and ten (10) seconds.

5. The portable toilet chemical recharge pumping system of claim **1** wherein said main conduit and said chemical conduit each are constructed of generally flexible hoses.

6. The portable toilet chemical recharge pumping system of claim **1** wherein operation of said chemical pump during said predetermined liquid chemical injection period results in injection of between approximately one to ten (1 to 10) ounces of chemical into said main conduit.

7. The portable toilet chemical recharge pumping system of claim **1** wherein operation of said water pump during said pre-injection water flush period, said predetermined liquid chemical injection period and said post-injection water flush period results in transfer of between approximately one to seven (1 to 7) gallons of water from said water source out of said anti-siphon check valve into a portable toilet being recharged.

8. A portable toilet chemical recharge pumping system comprising:

a water source;

a main conduit in liquid transmission connection with said water source at the inflow end thereof, said main conduit including a first main conduit section and a second main conduit section;

a water pump interposed between said first and second main conduit sections of said main conduit operative to draw water from said water source through said first main conduit section and force water onwards through said second main conduit section;

a liquid chemical solution source;

a chemical conduit in liquid transmission connection with said liquid chemical solution source, said chemical conduit including a first chemical conduit section and a second chemical conduit section;

a chemical pump interposed between said first and second chemical conduit sections of said chemical conduit operative to draw liquid chemical from said liquid chemical solution source through said first chemical conduit section and force liquid chemical onwards through said second chemical conduit section;

said second chemical conduit section connected in liquid chemical solution transmission to said second main conduit section whereby liquid chemical is added to the water flowing through said second main conduit section;

a water pump timer operative to engage and disengage said water pump;

a chemical pump timer operative to engage and disengage said chemical pump;

a chemical flow control valve operatively connected to said second chemical conduit section for controlling flow of liquid chemical through said second chemical conduit section;

an anti-siphon valve mounted on said main conduit at an outflow end of said main conduit, said anti-siphon valve operative to prevent fluid flow out of said outflow end of said main conduit when fluid flow force drops below a predetermined amount;

a solenoid switch operatively interposed between an electrical power source and said water pump timer and said chemical pump timer for simultaneously engaging said water pump timer and said chemical pump timer by permitting electricity to flow to the timers upon said solenoid switch being engaged;

said solenoid switch, said water pump timer, said chemical pump timer and said chemical flow control valve operative to control liquid flow through said main conduit and said chemical conduit with said solenoid switch simultaneously engaging said water pump timer and said chemical pump timer, said water pump timer initiating operation of said water pump for a predetermined pre-injection water flush period wherein water flows through said main conduit, said chemical pump timer then initiating operation of said chemical pump and opening of said chemical flow control valve for a predetermined liquid chemical injection period wherein liquid chemical flows through said chemical conduit through said chemical flow control valve into said main conduit to mix with said water such that the resulting water/chemical mixture flows through said anti-siphon valve out of said outflow end of said main conduit, said chemical pump timer then operative to close said chemical flow control valve and disengage said chemical pump upon a specified amount of liquid chemical being added to the water flow through said main conduit, said water pump timer then disengaging operation of said water pump following a predetermined post-injection water flush period wherein water flows through said main conduit out of said anti-siphon valve, said anti-siphon valve operative to prevent fluid flow out of said outflow end of said main conduit when said water pump is disengaged.

9. The portable toilet chemical recharge pumping system of claim **8** wherein said chemical flow control valve is a solenoid valve.

10. The portable toilet chemical recharge pumping system of claim **8** wherein said pre-injection water flush period is between one (1) and ten (10) seconds.

11. The portable toilet chemical recharge pumping system of claim **8** wherein said main conduit and said chemical conduit each are constructed of generally flexible hoses.

12. The portable toilet chemical recharge pumping system of claim **8** wherein operation of said chemical pump during said predetermined liquid chemical injection period results in injection of between approximately one to ten (1 to 10) ounces of chemical into said main conduit.

13. The portable toilet chemical recharge pumping system of claim **8** wherein operation of said water pump during said pre-injection water flush period, said predetermined liquid chemical injection period and said post-injection water flush period results in transfer of between approximately one to seven (1 to 7) gallons of water from said water source out of said anti-siphon check valve into a portable toilet being recharged.

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