A cleaning device having one or more water holding tanks having associated water supply outlets connected thereto and an associated pumping means to effect a supply of cleaning water under pressure from each of the one or more holding tanks; the device further including one or more return tanks having associated therewith a water return tank and a water return inlet and associated suction means to allow collection of water into the one or more return tanks. The water holding tanks are in fluid communication with the return tanks and having a series of intermediary filter and baffle elements positioned in a water flow path such that water passing from a return tank to a holding tank is subjected to sequential settling action en route.
CLEANING DEVICE

FIELD OF THE INVENTION

[0001] The present invention relates to a cleaning device. In particular, the present invention relates to a device and method used for cleaning surfaces such as roadways. Further, the present invention relates to a cleaning device that permits the recycling of cleaning water.

BACKGROUND OF THE INVENTION

[0002] There are many occasions on which small areas of a roadway or other similar surface might require cleaning and washing over a limited area. For example, where road works involve the cutting of sections of the roadway large amounts of dust and particulate concrete and so on are produced in the cutting action. Similarly, where spills of particulate matter or quantities of the contaminant may remain after the roadway has been swept. In the past the response to such situations has been simple to flush the affected surface and allow the particulate material, dust and the like to be washed into a stormwater drain and carried away. However, it has now been recognized that water resources are precious and that water catchments flowing into reservoirs, and into streams, rivers and oceans should not be contaminated undesirable materials. Local authorities have assumed some responsibility for water resource management and have taken steps to ensure that only appropriate materials enter the water supply.

[0003] To ensure that actions comply with legislation it is necessary to prevent materials from entering the storm water system. The present invention has been conceived with this in mind.

SUMMARY OF THE INVENTION

[0004] Therefore, according to a first aspect of the present invention there is provided a cleaning device including:

[0005] one or more water holding tanks having associated water supply outlets connected thereto and an associated pumping means to effect a supply of cleaning water under pressure from the one or more holding tanks;

[0006] one or more return tanks having associated therewith a water return tank and a water return inlet and associated suction means to allow collection of water into the one or more return tanks;

[0007] the one or more holding tanks being in fluid communication with the one or more return tanks and having a series of intermediary filter and baffle elements positioned in a water flow path such that water passing from a return tank to a holding tank is subjected to sequential settling action en route.

[0008] Thus, the device of the invention is adapted to hold a store of cleaning water in a holding tank and supply the cleaning water, under pressure to a surface to be cleaned. Through the return inlets used water can be collected under suction and held in the return tank. The used water may also incorporate a number of contaminant particulate materials which it would be undesirable to recirculate. The intermediary baffle elements allow a series of sequential separating steps to occur that remove the unwanted material. The device of the invention has been conceived principally for use in cleaning of roadway surfaces and, for this reason is preferably made of a relatively rugged construction. Further, it is not the purpose of the device to seek to remove all particulate contaminants but to clean the water sufficiently to allow recirculating of the water for further flushing and cleaning purposes.

[0009] The inventor has thus realized that for many cleaning and flushing purposes a traditional filter arrangement is unsuitable. For example a filter that is overly fine may require a high degree of maintenance and be subject to frequent blocking. Similarly a filter of too high a specification may require large amounts of energy, typically in the form of increased pressure to ensure that the a sufficient flow rate of water can be maintained through the unit. The unit of the invention provides for a relatively simple and rapid residency time that enables the water to be subject to a multi-stage settling and cleaning of gross contaminants.

[0010] Preferably, intermediary filter and baffle elements includes a first basket filter located below an inlet of the return tank and adapted to collect and retain large particulate material that settles under the action of gravity.

[0011] The intermediary filter and baffle elements may further include one or more settling area located in either the holding tank or the return tank, the settling area allowing water to remain there for a period and to allow particulate contaminates to settle and to allow water to pass out of the settling area by means of a water overflow or underflow device.

[0012] Preferably, the suction means associated with the one or more return tanks comprises a vacuum operative to produce a vacuum in a head space in the return tank. In such an arrangement, by maintaining the liquid level in the return tank and the supply tank the vacuum side of the device may be separated from the pressure side of the device.

DESCRIPTION OF DRAWINGS

[0013] For a clearer understanding of all its aspect the invention will now be described by way of example only with reference to the accompanying drawings in which:

[0014] FIG. 1 shows in schematic perspective view a cleaning device in accordance with a first aspect of the present invention;

[0015] FIG. 2 illustrates the cleaning device of FIG. 1 including all hose connections;

[0016] FIG. 3 illustrates in cross section the cleaning device of FIG. 1;

[0017] FIG. 4 shows a cutaway sectional view of a portion of the device of FIG. 1;

[0018] FIG. 5 illustrates in rear perspective view a second embodiment of the invention; and

[0019] FIG. 6 illustrates a third embodiment of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0020] Shown in the drawings are cleaning devices 10 (FIGS. 1-4), 60 (FIG. 5), and 100 (FIG. 6). In each case the
devices 10, 60, and 100 operate on similar principles and have a number of features in common. The cleaning devices 10, 60, 100 are designed to be filled with a recirculating water supply and include a number of interconnected water holding tanks. Where like features are described in the drawings like numerals will be used to refer to these features.

[0021] Turning to the device illustrated in Figs. 1-4, the cleaning device 10 includes an arrangement of three separate water holding tanks being a centrally located water return tank 12 and two outer water holding and supply tanks 14a, 14b respectively. In the embodiment under consideration the tanks of the device are constructed of steel and have been hot dip galvanized to improve their corrosion resistance. As can be seen to bets advantage in FIG. 2, the tanks 12, 14a and 14b have associated therewith water supply hoses 16a, 16b, a water return hose 18 and sundry pipe connections to be described in detail hereinbelow. In broad detail water circulates through the system from the tanks 14a, 14b through the hoses 16a, 16b and is returned through the return hose 18 into the return tank 12.

[0022] The water supply system is driven by a pump 20 positioned beneath the return tank 12, which is elevated with respect to the supply tanks 14a, 14b to accommodate the pump 20. Leading out of the pump 20 is a supply manifold pipe 22 to which the hoses 14a and 14b are connected. The supply from each of the hoses 16a, 16b is also controlled by means of respective valves 24a, 24b. Each of the hoses 16a and 16b are attached to a respective hose reel 26a and 26b connected to the upper surface of the supply tanks 14a, 14b.

[0023] The pump 20 draws a water supply from the supply tanks 14a, 14b through supply line 28 which has an opening 28a, 28b in each of the tanks 14a, 14b. The tanks 14a, 14b hold a supply of cleaned water to be used in the cleaning and mopping process for which the device 10 is suited. Thus, the openings 28a, 28b of the supply line 28 are located spaced apart from the base of the tanks 14a, 14b.

[0024] The return tank 12 includes an inlet point 30 to which is attached the inlet hose 18. The inlet hose 18 terminates in a suction head 34 used to collect water that has been used for flushing/cleaning actions and any spills needed to be collected. The inlet point 30 is close to an upper corner of the return tank 12.

[0025] Adjacent the inlet point 30 and positioned on top of the return tank 12 is a vacuum device 36. The vacuum device 36 is in fluid communication with the suction head 34 through the hose 32 and serves to provide the motive force that collects water through the suction head. The vacuum device has an external power supply (not shown).

[0026] Alternatively, the vacuum device can be connected to a mains power supply or to a vehicle power supply.

[0027] The device 10 is not designed for the purposes of producing a pristine surface and there is no requirement that the water, or other fluid supplied from the tanks 14a, 14b be entirely free of contamination. For general flushing and cleaning purposes it is, however, preferable that any gross contaminants are removed from the water. It will also be appreciated that larger particulate contaminants in the water could potentially interfere with the action of the pump apparatus 20 and that accordingly it is desirable to have such particles removed.

[0028] Water or other fluid entering the return tank 12 through the inlet point 30 is confined to a corner of the return tank 12 and by means of an angular baffle 38 that, together with the corner of the tank 12 defines a generally columnar space that extends downwardly from an upper corner of the tank 12 to a lower corner of the tank 12. The base of the return tank 12 below the baffle section 38 slopes towards downwardly. Thus, water entering the return tank 12 is directed to travel downwardly in the space and any heavy particulate material carried in the water settles at the bottom of the tank 12 which has a sloping bottom 40 to facilitate this process. In some forms of the invention a removable collecting basket (not shown) can be positioned below the columnar section to facilitate easy removal of any material collected.

[0029] As the liquid level in the return tank 12 rises a separation of the heavier contaminants from the water has occurred, and, accordingly, the water towards the upper surface is cleaner. At a certain point the water level encounters a series of overflow apertures 42 in the sides 41 of the return tank 12 that are common to the return tank 12 and the holding tanks 14a, 14b on either side of the tank 12. The apertures 42 are generally aligned horizontally and allow water to flow from the return tank 12 into each of the water holding tanks 14a, 14b. The overflow apertures are positioned such that the water flows into the water holding tanks 14a, 14b at an upper edge thereof.

[0030] The water holding tanks 14a, 14b are partitioned from their upper edges by a partition 44 that extends parallel to the inner sides 41 of the tanks 14a, 14b from an upper inside surface of the tanks 14a, 14b towards the bottom of the tanks. A gap 46 exists between a lower edge of the partition 44 and the base of the tanks 14a, 14b.

[0031] Thus water entering the tanks 14a, 14b is initially directed in a downward flow direction thereby encouraging any remaining undesirable particulate material to settle on the base of the tanks. As the level rises in the tanks 14a, 14b, the water is available for recirculation through the openings 28a, 28b.

[0032] Thus, in use the device 10 may be carried on a trailer to any site where it is needed and with relatively low water wastage perform a cleaning or surface flushing function. Where the device becomes full of liquid unsuitable for further use it is possible to drain each of the tanks 12, 14a, and 14b through lowermost drain holes 50. Similarly, at any remote location, the tanks can be opened through hinged lids 52 for more thorough cleaning.

[0033] An alternative form of the invention is illustrated in FIG. 5. In most respects the device 60 is identical to the device 10. However, located at the rear of the device is a pair of element filters 62 arranged in series in the supply line extending from the pump 20. The element filters 62 each have attached thereto a respective purge valve 64 that enables the line to be purged should the line become blocked. Further the arrangement can be set up such that the pump stops when the filter becomes blocked. Such an arrangement might be preferred where a positive displacement pump is used in the device.

[0034] It is also possible to create a cleaning device in accordance with the invention using modular tanks that are inter connected to allow flow there between. FIG. 6 illustrates such an arrangement where three distinct tanks are used to create an arrangement 100.
The invention has been described by way of example. The examples are not, however, to be taken as limiting the scope of the invention in any way. Modifications and variations of the invention such as would be apparent to a skilled addressee are deemed to be within the scope of the invention.

1. A cleaning device including:
   a water holding tank having an associated water supply outlet connected thereto and an associated pumping means to effect a supply of cleaning water under pressure from the holding-tank;
   a return tank having associated therewith a water return inlet and associated suction means to allow collection of water into the return tank;
   the holding tank being in fluid communication with the return tank and having a series of intermediary filter and baffle elements positioned in a water flow path such that water passing from the return tank to the holding tank is subjected to sequential settling action en route.

2. The cleaning device according to claim 1, wherein the intermediary filter and baffle elements include a first basket filter located below an inlet of the return tank and adapted to collect and retain large particulate material that settles under the action of gravity.

3. The cleaning device according to claim 1, wherein the intermediary filter and baffle elements may include one or more settling areas located in either the holding tank or the return tank, each settling area allowing water to remain there for a period to allow particulate contaminants to settle.

4. The cleaning device according to claim 3, wherein water passes out of the settling area by means of one of a water overflow or water underflow device.

5. The cleaning device according to claim 1, wherein the suction means associated with the return tank comprises a vacuum device operative to produce a vacuum in a head space in the return tank; and wherein a liquid level in the return tank and the holding tank is maintained whereby the vacuum side of the cleaning device is separated from the pressure side of the cleaning device.

6. The cleaning device according to claim 1, wherein there is provided an arrangement of three separate water tanks being a centrally located water return tank and two outer water holding tanks respectively.

7. The cleaning device according to claim 6; further comprising a pump positioned beneath the centrally located water return tank, the pump drawing water from each water holding tank.

8. The cleaning device according to claim 7, in which a supply manifold pipe leads out of the pump, the supply manifold having connected thereto hoses controlled by means of respective valves.

9. The cleaning device according to claim 1, wherein the water holding tank and the water return tank of the cleaning device are constructed of steel and are hot dip galvanized to improve corrosion resistance.

10. The cleaning device according to claim 1, wherein the return tank includes a vacuum device in fluid communication with a suction head through a hose.

11. The cleaning device according to claim 1, wherein fluid entering the return tank through the water return inlet is confined to a corner of the return tank by means of a baffle that, together with the corner of the return tank defines a generally columnar space extending downwardly from an upper corner of the return tank to a lower corner of the return tank.

12. The cleaning device according to claim 11, wherein the return tank includes a base; and that portion of the base of the return tank below the generally columnar space slopes downwardly to encourage settling of particulate material on the base of the return tank.

13. The cleaning device according to claim 12, additionally including a removable collecting basket positioned below the columnar space to facilitate easy removal of any particulate material collected.

14. The cleaning device according to claim 1, in which the water return tank has sides which include a series of overflow apertures therein, the overflow apertures serving to allow water from the return tank to pass into the water holding tank.

15. The cleaning device according to claim 14, in which the water holding tank has inner sides; an upper inside surface and a base; and wherein the holding tank is partitioned by a partition that extends parallel to the holding tank's inner sides from the upper inside surface downwardly towards the base of the holding tank, the partition leaving a gap between a lower edge of the partition and the base of the holding tank, and wherein the partition is located adjacent a side of the holding tank which includes the overflow apertures from the return tank; whereby water entering the holding tank from the return tank is initially directed in a downward flow encouraging any remaining undesirable particulate material to settle on the base of the holding tank.

16. The cleaning device according to claim 1; in which a supply line leading from the pump is equipped with a series of element filters, the element filters each having attached thereto a purge valve that enables the supply line to be purged should the line become blocked.

17. The cleaning device according to claim 1, wherein the water return and water holding tanks are constructed separately in modules and are connected for use.

18. The cleaning device according to claim 1, wherein the device includes one or more water holding tanks in fluid communication with one or more water return tanks.