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STORAGE TANK SIPHON

Abstract

The disclosure is directed at a tank siphon that is used to remove sediment from a bottom of a water storage tank to improve a quality of the collected water. The siphon includes a tube portion having a suction adapter at one end of the tube portion; and a siphon tube receptacle at the other end of the tube portion.

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Background/Summary

CROSS-REFERENCE TO OTHER APPLICATIONS [0001] The present disclosure claims priority from U.S. Provisional Application No. 63/551,608 filed on Feb. 9, 2024 which is hereby incorporated by reference.

FIELD

[0002] The present disclosure relates generally to storage tanks. More particularly, the present disclosure relates to systems and devices for storage tank siphons that may be used for removing matter or sediment from water storage tanks.

BACKGROUND

[0003] Water is a valuable resource and its conservation is important. Water may be collected and stored in storage tanks until required for end uses such as toilet flushing, laundry, irrigation, industrial processes, and other applications. The stored water typically offsets the demand on other water sources such as a municipal water source, a lake or a well. In some cases, rainwater or water harvesting may be needed where access to water is limited and/or existing water sources may be contaminated.

[0004] During water collection and storage, water storage tanks can and typically do accumulate sediment or other debris that may be disturbed when water enters the tanks or when water is pumped out of the storage system. This lowers the perceived or actual quality of the water that has been collected.

[0005] Larger conventional water storage systems may be cleaned manually to remove sediment or debris; however, this process may be dirty, difficult and/or time-consuming. In addition, the manual cleaning of large storage tanks may be hazardous requiring a person to enter inside the tank in order to clean it. In many water storage tanks, a presence of various tank fittings, valves, and other tank components typically do not allow for the installation of a low point drain that would allow sediment to be drained or removed from a bottom of the storage tank. As such, there is an unmet need in the art for a system or device to enable sediment and debris removal from water storage tanks.

[0006] Therefore, there is provided a novel storage tank siphon that may be used for removing matter or sediment from water storage tanks.

SUMMARY

[0007] According to an aspect herein, there is provided systems and devices for storage tank siphons that may be used for removing matter from water storage tanks.

[0008] In one aspect, the siphon includes a siphon tube that is designed to receive a suction source at one end. The siphon may include a suction adapter that enables connection between the siphon tube and the suction source.

[0009] The other end of the siphon is positioned at a bottom of the storage tank such that sediment at the bottom of the storage tank can travel through the siphon tube when suction is applied at the other end. The positioning of the bottom end of the siphon may be via a set of lugs or the tube may rest on the bottom of the storage tank. The siphon tube may also include aeration holes to improve suction power. In another aspect of the disclosure, there is provided a tank siphon including a tube portion including a suction adapter at one end of the tube portion; and a siphon tube receptacle at the other end of the tube portion.

[0010] In another aspect, the suction adapter is attached to the tube portion via a friction fit. In yet another aspect, the suction adapter includes a fitting for receiving a suction source. In a further aspect, the fitting is stepped to receive different sized suction sources. In yet a further aspect, siphon tube receptable includes a notched area. In another aspect, the tube portion includes a set of aeration holes.

[0011] In yet another aspect of the disclosure, there is provided a sediment collection apparatus for a water storage tank including a tank siphon including a tube portion including a suction adapter at one end of the tube portion; and a siphon tube receptacle at the other end of the tube portion;

wherein the siphon tube receptable is positioned at a bottom of the water storage tank and the suction adapter extends through an upper surface of the water surface tank.
[0012] In a further aspect, the suction adapter is attached to the tube portion via a friction fit. In yet another aspect, the suction adapter includes a fitting for receiving a suction source. In yet a further aspect, the fitting is stepped to receive different sized suction sources. In another aspect, the siphon tube receptable includes a notched area. In an aspect, the tube portion includes a set of aeriation holes.

Description

BRIEF DESCRIPTION OF FIGURES
[0013] Other aspects and features of the embodiments of the system and method will become apparent to those ordinarily skilled in the art upon review of the following description of specific embodiments in conjunction with the accompanying figures.
[0014] Embodiments of the system and method will now be described, by way of example only, with reference to the attached Figures, wherein:
[0015] FIG. **1** is a perspective view of a water storage tank that includes a siphon according to an embodiment herein;
[0016] FIG. **2** is a perspective view of the water storage tank of FIG. **1** with a portion cut away to show the siphon;
[0017] FIG. **3** is a perspective view of the water storage tank of FIG. **1** with an expanded view of the suction adapter and the siphon receptacle;
[0018] FIG. **4** is side view of the water storage tank of FIG. **1** with a portion cut away to show the siphon;
[0019] FIG. **5** is a top view of the water storage tank of FIG. **1** with the same portion cut away as FIG. **4**; and
[0020] FIGS. **6***a* to **6***c* are perspective views of another embodiment of a storage tank siphon with expanded views.
DETAILED DESCRIPTION
[0021] The following description, with reference to the accompanying drawings, is provided to assist in understanding the example embodiments. The following description includes various specific details to assist in that understanding but these are to be regarded as merely examples. Accordingly, those of ordinary skill in the art will recognize that the various embodiments described herein, and changes and modifications thereto, can be modified without departing from the scope and spirit of the disclosure and their equivalents. In addition, descriptions of well-known functions and constructions may be omitted for clarity and conciseness.
[0022] The terms and words used in the following description and claims are not limited to their bibliographical meanings, but are meant to be interpreted in context and used to enable a clear and consistent understanding.
[0023] FIG. **1** is a perspective view of a water storage tank **100** while FIG. **2** is a perspective view of the water storage tank **100** with a portion cut away to show a siphon **110** in more detail.
[0024] As shown in FIG. **1**, the storage tank **100** includes a removable cover **102** that covers or protects an opening (not shown) for receiving water. In some embodiments, water may be poured into the storage tank via the opening and in other embodiments, the cover **102** may be removed and water, such as, but not limited to, rainwater, may be collected through the opening. In further embodiments, the storage tank **100** may be part of a water collection system that includes other components that direct water towards the opening of the storage tank for collection.
[0025] The top of the storage tank **100** includes a hole **108** through which one end of a siphon tube **110** (shown in more detail in FIG. **2**) may be inserted or extended through. In the current

embodiment, a water outlet **112** is located at a bottom of the storage tank **100** where water that has been collected in the storage tank may be accessed. In some embodiments, a hose may be attached to the water outlet **112** while in other embodiments, a tap may be attached. In other embodiments, there the storage tank **100** may not include a water outlet whereby the water can be accessed in a different manner.

[0026] In use, the water storage tank **100** collects and stores water though the opening which is covered by the cover **102**. As will be understood, the water storage tank **100** may be of any size depending on the design or water requirements. For example, a water storage tank designed for domestic use will likely be smaller than one designed for industrial use.

[0027] As more clearly shown in FIG. **2**, the siphon **110** includes a siphon tube **114** that has a siphon tube receptacle **116** at one end **122** and a suction adapter **118** at an opposite end **120** of the siphon tube **114**. The siphon tube receptacle end **116** is located proximate a bottom of the storage tank **100** while the suction adapter **118** fts into, and sometimes, through the hole **108**.

[0028] In one embodiment, the suction adapter **118** may have a shape complementary to the second end **120** of the siphon tube **114** to provide a friction fit coupling between the suction adapter **118** and the siphon tube **114** to reduce the flow of air or other fluids through the connection. Other methods of connecting the suction adapter **118** and the second end **120** are contemplated including integrating the suction adapter into the siphon tube or designing the suction adapter as part of the siphon tube. In some embodiments, the connection or coupling between suction adapter **118** and the second end **120** is airtight. In other embodiments, the suction adapter **118** may be adhered to the second end **120**. In some embodiments, the suction source may be connected directly to the siphon tube **114** without the need for the suction adapter whereby the second end **120** extend into or through the hole **108**.

[0029] After water has been collected in the storage tank **100**, sediment and debris will naturally collect at the bottom of the storage tank **100**, however, in some situations, the sediment may attach to the sides of the storage tank **100**. When there is a need to clean the storage tank, the sediment present on the inside walls of tank **100** may be wiped off or forced off using a stream of water which may cause further sediment to fall to the bottom of the storage tank.

[0030] When necessary, the siphon **110** is used to remove debris, sediment or the like near or at the bottom of the storage tank **100**. In order to remove the debris or sediment, a suction source is coupled to the suction adapter **118** (or directly to the siphon tube **114** when there is no suction adapter **118**) to apply suction to the siphon **110**. One example of a suction source is a wet/dry vacuum.

[0031] The applied suction draws material within the storage tank **100**, such as sediment on the floor or bottom of the storage tank **100**, out of the storage tank **100** through the siphon tube receptacle **116**, the siphon tube **114** and the suction adapter **118** (when present). In some embodiments, depending on the size, shape, and position of the siphon tube receptacle **116** and/or the siphon tube **114**, the material drawn out of the storage tank **100** may include both water and sediment.

[0032] FIG. **3** is another perspective view of the water storage tank **100** with expanded views of the connection between the suction adapter **118** and the second end **120** of the siphon tube **114** and the connection between the siphon receptacle **116** and the first end **122** of the siphon tube **114**.

[0033] As shown in the embodiment of FIG. **3**, the suction adapter **118** includes a fitting **124** (or suction coupling end) having a size and a shape to allow the suction adapter **118** to be coupled to or receive a suction source. The shape of suction adapter **118** (or fitting **124**) may be stepped such that the suction adapter **118** is capable of receiving different sized suction sources enabling the siphon to be coupled to different sized suction device nozzles. In some embodiments, a portion of the fitting **124** may be located external to the storage tank **100** to form a continuous passageway from the siphon receptacle **116** to the exterior of the storage tank **100** via the siphon tube **114**.

[0034] In the embodiment of FIG. **3**, the siphon receptacle **116** sits, or rests, within a plurality of

lugs **126** extending from a bottom of the storage tank **100**. The lugs **126** hold the siphon tube **114** in place when it is installed within the storage tank **100**. In some embodiments, the plurality of lugs **126** may be formed integrally with the bottom of the storage tank **100** such that the lugs **126** hold or support the siphon tube **114** to be in a vertical orientation. In alternative embodiments, any or all of the plurality of lugs **126** may be formed individually as discrete components and coupled to, fastened to, or adhered to the bottom of the storage tank **100**. In some embodiments, the lugs **126** may form part of or the entirety of the siphon receptacle **116**.

[0035] The plurality of lugs **126** are positioned to retain, or secure, the siphon tube **114** in position on the bottom of the storage tank **100** and to vertically align the siphon tube during installation to secure the bottom of siphon tube **114** within the storage tank **100**. The lugs **126** may also provide or allow for a clearance or spacing between the first end **122** of the siphon tube **114** and the bottom of the water storage tank **100**. This allows for sediment to be sucked into the siphon tube **114** and to provide improved, optimal or maximum suction. The plurality of lugs **126** may also support the bottom of the siphon **110** off the base or bottom of the storage tank **100**. The lugs may support the bottom of the siphon **110** at a distance that positions the first end **122** of the siphon **110** below the highest water level after drain down in the storage tank to ensure or improve the draw of sediment and/or water up the siphon tube **114**. The clearances between the bottom of the siphon **114** and the bottom of the storage tank **100** are minimized or reduced to facilitate maximum or a high level of water removal from the surface of bottom of the storage tank **100** which further enhances removal of debris and sediment. The spacings between the lugs **126** are positioned to maximize or improve available suction area into the first end of the siphon tube **122** to improve suction and flow rate of drawdown. However, it is understood that different applications and storage tank size necessitate a varying degree of spacing of the plurality of lugs **126** and the distance at which they support siphon **110** off the bottom of the water storage tank **100**.

[0036] In some embodiments, a plurality of gaps **128** are present between the plurality of lugs **126** and the end of the siphon tube **114**. In the detailed view of FIG. **3**, the gap **128** between two adjacent lugs **126** is shown.

[0037] Each of the gaps **128** allows passage of material, such as sediment at the bottom of the storage tank **110** to travel between the lugs **126** into the siphon tube **114** as suction is applied to the siphon tube **114**. The size, shape, and location of each of the plurality of gaps **128** is determined by the position of the end of the siphon tube **114** with respect to the bottom of the water storage tank and the size, shape and/or positioning of the plurality of the lugs **126**. The rate of flow of material through each of the plurality of gaps **128**, and the amount of sediment present in the material flowing therethrough, depends on the size, shape, and location of each of the plurality of gaps **128**. In one embodiment, there is a plurality of slots and/or dimensions at the first end **122** and openings/holes required further up the siphon tube that are necessary to improve, optimize or maximize suction to facilitate lifting water and debris the entire height of the siphon tube.

[0038] FIG. **4** is side view of the water storage tank **100** with a portion cut away to show the siphon **110**. FIG. **5** is a top view of the water storage tank **100** with the same portion cut away as FIG. **4**.

[0039] FIG. **6***a* is a perspective cut-away view of another embodiment of a tank siphon within a water storage tank. FIG. **6***b* is a cut-away view of the storage tank in the direction of arrow **600** in FIG. **6***a*. FIG. **6***c* is a cut-away view of the storage tank in the direction of arrow **602** of FIG. **6***a*.

[0040] In the embodiment shown in FIG. **6***a*, a storage tank **610** includes a tank siphon **612** including a siphon tube **614** with a suction adapter **616** located at one end of the tube **614**. As discussed previously, the suction adapter **616** (when present) may be connected to or coupled with a suction source to draw sediment that has collected at a bottom of the storage tank out of the tank through the siphon tube **614** from a siphon receptacle end **618**.

[0041] Unlike the previously described embodiments, a siphon receptacle is integrated into the siphon tube **614** to stand at the bottom of the storage tank **610**. As can be seen, there are no plurality of lugs supporting the siphon tube **614**. At the bottom end **618**, the tube includes at least

one cut out **620** or notch that positions the siphon tube **614** such that there is a clearance or spacing for sediment or debris on the bottom of the storage tank **610** to enter the tube **614** when suction is applied to the other end of the tube. The clearance between the siphon tube **614** and the bottom of the storage tank **610** is minimized or reduced to facilitate maximum or a high level of water removal from the surface of the bottom of storage tank **610** which further enhances removal of debris and sediment. The area of the cut out or notch **620** is maximized or selected to provide improved sediment removal while also minimizing or lowering the height of the cut out or notch **620** to provide maximum or a high level of water removal from the surface of the bottom of the storage tank **610** further enhancing removal of debris and sediment. As shown in FIGS. **6***a* to **6***c*, the siphon tube **614** may also include aeration holes **622** to facilitate improved, optimum or maximum suction draw capability up the length of the siphon tube into the suction equipment or suction source. Aeration holes **622** may be round, rectangular, slotted or of any other shape and of varying sizes determined by the diameter of siphon **612** and other storage tank **622** dimensional factors. The position of aeration holes **622** may be determined by the desired drain down water level in a storage tank **612**, and are most effective when located immediately above the lowest water level after drain down to provide optimal or improved aeration.

[0042] The siphon tube is made from a material, such as, but not limited to, polyvinyl chloride (PVC), high-density polyethylene (HDPE) or any other material that is sturdy enough to stand or rest at the bottom of the storage tank without being knocked over by the force of the water flow within the storage tank.

[0043] While various reference numerals have been used to identify various elements in the embodiments, it will be understood that a similar term used to refer to elements having different reference numerals will generally refer to the same type of element and that elements may be interchangeable among the embodiments as would be known to one of skill in the art.

[0044] In the preceding description, for purposes of explanation, numerous details are set forth in order to provide a thorough understanding of the embodiments of the disclosure. However, it will be apparent to one skilled in the art that these specific details are not required in order to practice the disclosure. Thus, the breath and scope of the present disclosure should not be limited by any of the above-described exemplary embodiments but should be defined only in accordance with the appended claims and their equivalents. It will also be understood that each feature of each embodiment discussed herein, and of each reference cited herein can be used in combination with the features of any embodiment.

[0045] The above-described embodiments of the disclosure are intended to be examples only. Alterations, modifications and variations can be effected to the particular embodiments by those of skill in the art without departing from the scope of the disclosure, which is defined solely by the claims appended hereto.

Claims

1. A tank siphon comprising: a tube portion including: a suction adapter at one end of the tube portion; and a siphon tube receptacle at the other end of the tube portion.

2. The tank siphon of claim 1 wherein the suction adapter is attached to the tube portion via a friction fit.

3. The tank siphon of claim 2 wherein the suction adapter comprises a fitting for receiving a suction source.

4. The tank siphon of claim 3 wherein the fitting is stepped to receive different sized suction sources.

5. The tank siphon of claim 1 wherein the siphon tube receptable comprises a notched area.

6. The tank siphon of claim 1 wherein the tube portion comprises a set of aeration holes.

7. A sediment collection apparatus for a water storage tank comprising: a tank siphon including: a

tube portion including: a suction adapter at one end of the tube portion; and a siphon tube receptacle at the other end of the tube portion; wherein the siphon tube receptable is positioned at a bottom of the water storage tank and the suction adapter extends through an upper surface of the water surface tank.

8. The sediment collection apparatus of claim 7 wherein the suction adapter is attached to the tube portion via a friction fit.

9. The sediment collection apparatus of claim 8 wherein the suction adapter comprises a fitting for receiving a suction source.

10. The sediment collection apparatus of claim 9 wherein the fitting is stepped to receive different sized suction sources.

11. The sediment collection apparatus of claim 7 wherein the siphon tube receptable comprises a notched area.

12. The sediment collection apparatus of claim 7 wherein the tube portion comprises a set of aeration holes.