A device is provided that is adapted for selective interconnection to a conduit, thereby providing protection to cleaning hoses. More specifically, a mechanism that employs a plurality of rollers, and roller support arms, which act as stand-offs on which the hose may freely travel while being protected from damage potentially imparted by the lip of the conduit is provided.
HOSE PROTECTION DEVICE

[0001] This application claims the benefit of U.S. Provisional Patent Application Ser. No. 60/673,684, filed Apr. 22, 2005, which is incorporated by reference in its entirety herein.

FIELD OF THE INVENTION

[0002] The present invention relates generally to a hose protection device. More specifically, one embodiment of the present invention is adapted for interconnection with a conduit, such as a storm drain culvert, in order to protect expensive hoses that are employed within the conduit for cleaning or other maintenance operations.

BACKGROUND OF THE INVENTION

[0003] The present invention relates to a device and a method for protecting hoses employed to clean conduits, such as culverts. Conduits, especially those with small internal diameters, tend to become obstructed by debris thereby reducing, or eliminating their flow capacity. For example, debris such as tree limbs, mud, gravel, moss, trash, etc. often find their way into storm sewers after a heavy rain, wherein the conduit becomes completely clogged, or severely restricted, thereby potentially exacerbating flooding. In addition, often local ordinances or standard maintenance procedures dictate that conduits be cleaned at predetermined intervals to remove any buildup of trash and debris, and hence help maintain a desirable flow rate through the conduit.

[0004] Currently, the cleaning of conduits, such as concrete culverts, is generally accomplished with a high-pressure nozzle that is interconnected to a hose. Typical nozzles of the art are often able to discharge pressures up to 2000 psi, and are designed to blast the inner wall of a conduit to remove debris. Further, many nozzles emit high pressure fluid in a plurality of directions, and many nozzles use a rearward-directed high pressure stream to propel itself through the conduit while it is performing its cleaning operation.

[0005] Cleaning operations are typically performed by a one or two man crew that arrive at a conduit opening, deploy the nozzle and fluid supply hose from a delivery vehicle, feed the nozzle and hose into the conduit, and initiate cleaning by directing fluid through the nozzle. After cleaning, the hose is rewound and stored in the delivery vehicle. A similar process may also be used to treat the inner surface of a conduit, such as adding a sealant thereto.

[0006] The major downfall of this process is the previously described hose removal. More specifically, the hoses used are very expensive due to their ability to carry extremely high pressures. In addition, hoses are also often difficult and time consuming to construct and handle. The hoses are usually constructed of rubber, plastic, braided flexible metal hose, or a combination thereof. When the hose is removed from the conduit it is dragged across the edge, or lip, of the conduit opening, thereby potentially damaging the hose. Frictional damage alone is generally enough to impart localized thinning of the hose. Once the hose thickness is reduced, it may be un-reparable and/or impractical to use because of the risk that the hose may fail under extreme pressures.

[0007] Thus, there is a long felt need in the field of conduit maintenance, for a device adapted to selectively engage with the hose used in the cleaning or treatment operations that provides protection to the hose during removal from the conduit. The following disclosure describes a device that is adapted to interconnect to conduits of various diameters, and which provides protection to hoses used during maintenance processes.

SUMMARY OF THE INVENTION

[0008] It is one aspect of the present invention to provide a hose protection device that is adapted for selective interconnection with various sizes of fluid conduits. Often, the same nozzle and hose combination will be utilized in many locations to treat a variety of conduits of various dimensions. One embodiment of the present invention provides a device that quickly and easily interconnects to an opening of most conduits. In one embodiment, the present invention includes a clamp that is adapted for interconnection to a conduit opening, and be secured thereto via threaded bolts. Other embodiments of the present invention may be easily sealed to fit specific pipe lines, or a range of similar conduits or openings with a variety of different geometric configurations.

[0009] It is a related aspect of the present invention that the hose protection device is easy to install. One embodiment of the present invention is equipped with a hand actuated clamp securement mechanisms, for example set screws. To install, a user slides the clamp onto the lip of the conduit opening. The securement devices are then used to hold the device in place. One skilled in the art will appreciate that other securement means may be used to achieve the objectives of the present invention, such as clamping, or hingedly interconnecting the clamp portions.

[0010] As briefly mentioned above, it is yet another aspect of the present invention to provide rollers that are adapted to support and protect the hose. Preferably, one embodiment of the invention includes a plurality of support arms that are interconnected to the clamp at predetermined locations. Rolling members, such as a cylindrical shafts, are operably connected to the support arms to provide supporting locations for the hose. During insertion and removal of the hose from the conduit, the rollers are adapted to rotate thereby preventing damage to the hose. The rollers may be constructed from a tubular member with a rod or screw positioned therethrough that is interconnected to the support arms. Alternatively, linear bearings may be employed that are interconnected to the roller support arms to allow rotation of the rollers. Another related embodiment of the present invention employs rollers that are at least partially constructed from a compliant material, for example foam rubber, to reduce bearing loads imparted on the hose by the rollers.

[0011] It is another aspect of the present invention to provide a hose protection device that is easy to manufacture. The present invention may be constructed from a plurality of
materials, such as stainless steel, carbon steel, iron, Inconel, aluminum, plastic, carbon fiber composite, etc. Preferably, in one embodiment of the present invention, steel or aluminum is used, because of their weldability and resistance to corrosion. Corrosion resistance is important due to the high moisture content working environment in which the present invention is used, thus the present invention may also be painted, or otherwise treated, to ensure at least some resistance to corrosion. However, one may alternatively forgo corrosion resistance and choose to replace the device when it becomes apparent that material failure may occur.

[0012] Thus, it is one aspect of the present invention to provide a hose protection device comprising:

[0013] a clamping means adapted for selective interconnection to an opening of the conduit;

[0014] at least one guide means having a first end and a second end, said first end interconnected to said clamping means while said second end extends beyond the opening of the conduit;

[0015] a hose engagement means operably interconnected to said at least one guide means that is adapted to receive and support the flexible hose a predetermined distance from the opening of the conduit.

[0016] The Summary of the Invention is neither intended nor should it be construed as being representative of the full extent and scope of the present invention. The present invention is set forth in various levels of detail in the Summary of the Invention as well as in the attached drawings and the Detailed Description of the Invention and no limitation as to the scope of the present invention is intended by either the inclusion or non-inclusion of elements, components, etc. in this Summary of the Invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] The accompanying drawings, which are incorporated in and constitute a part of the specification, illustrate embodiments of the invention and together with the general Summary of the Invention given above and the Detailed Description of the drawings given below, serve to explain the principles of these embodiments.

[0018] FIG. 1 is a front perspective view of one embodiment of the present invention; and

[0019] FIG. 2 is a partial front cross sectional view of the present invention shown interconnected to a lip of a conduit such as a pipe.

[0020] It should be understood that the drawings are not necessarily to scale. In certain instances, details that are not necessary for an understanding of the invention or that render other details difficult to perceive may have been omitted. It should be understood, of course, that the invention is not necessarily limited to the particular embodiments illustrated herein.

[0021] To assist in the understanding of the present invention the following list of components and associated numbering found in the drawings is provided herein:

[0022] # Component
[0023] 2 Hose protection device
[0024] 4 Clamp

[0025] 8 Conduit opening
[0026] 12 Conduit
[0027] 14 Securing mechanism
[0028] 16 Roller
[0029] 18 Roller support arm
[0030] 20 Hose
[0031] 22 Shaft
[0032] 24 Fluidjet
[0033] 26 Nozzle
[0034] 28 Stops
[0035] 30 Ground

DETAILED DESCRIPTION

[0036] Referring now to FIGS. 1 and 2, one embodiment of a hose protection device that is adapted for interconnection to a conduit 12. The hose protection device 2 is generally constructed of a clamp 4 and a plurality of rollers 16 that ensure the hose is sufficiently offset from the lip of a conduit opening 8. Upon engagement of the clamp 8 to the conduit opening 8, one or more clamp securing mechanisms 14 are employed, to secure the hose protection device 2 to the conduit 12. The rollers 16 of the device are operably interconnected to a plurality of roller support arms 18, and are adapted to receive and support a hose 20, thereby allowing the hose 20 to bend freely while reducing friction and wear on the hose 20 when it is inserted and removed from the conduit 12.

[0037] Referring now to FIG. 1, one embodiment of the present invention is shown. The present invention generally includes the clamp 4, the plurality of roller support arms 18, and the plurality of rollers 16. More specifically, one embodiment of the present invention is adapted for interconnection to the lip of a conduit and secure thereto. The plurality of rollers 16 are supported by a plurality of roller support arms 18 and adapted to receive and hold a hose away from the lip of the conduit 8, and thus provide a reduced friction path for travel when the hose is moved within and out of the conduit 12. One embodiment of the present invention employs generally planar roller support arms 18, that are interconnected in pairs to opposite sides of the clamp 4, and are adapted to secure the rollers 16 a predetermined distance from the conduit opening 8. Preferably, the roller support arms 18 are adapted to receive a shaft 22, such as a bolt that is threaded through the roller 16. Alternatively, linear bearings that allow for smooth rotation of the rollers 16 may be employed. As will be appreciated by one skilled in the art, the present invention may be scaled, or otherwise altered, to accommodate various sizes and types of conduits. For example, the support arms 18 and placement of the rollers 16 therein may be altered to produce varying offsets. The angles between support arm pairs may also be altered to accommodate different sized hoses. For example, larger diameter hoses will require a larger offset to yield a large bend radius to prevent hose kinking.

[0038] Referring now to FIG. 2, the present invention as employed on a conduit opening 8 is shown. More specifically, a fluid nozzle 26 and hose 20, which is adapted selectively engage the rollers 16 of the present invention, are
shown in operation inside the culvert 12. Within the culvert, a plurality of jets 24 are used to perform high pressure treatment or cleaning of the culvert 12. The high pressure fluid 24 is created by a nozzle 26, wherein the fluid is supplied from a truck, or other fluid supply source, via the hose 20. The rearward force of some of the jets 24 propels the nozzle 26 further into the culvert 12 and directs waste out of the conduit 8, thereby cleaning the selected portion of the conduit 12. Once complete, a spool on the truck is activated, thereby rewinding the hose 20 and nozzle 26 from the culvert 12.

[0039] In one embodiment of the present invention, a user selectively secures the clamp 4 to the conduit opening 8. The nozzle 26 and hose 20 are then placed on the rollers 16. During deployment, the high pressure fluid 24 will tend to straighten out the hose 20. Thus, a plurality of stops 28 are also incorporated on the roller support arms 18 to prevent disengagement of the hose 20 from the present invention 2. The rollers 16 also allow the hose 20 to bend as designed, yet offset it from the opening 8 of the conduit 12. Upon completion of the task, the spool on the truck is activated, thereby removing the nozzle 26 and hose 20 from the conduit 12. The rollers 16 of the present invention are designed to maintain the hose a predetermined distance from the lip 8 of the culvert 12, while providing a smooth travel path, and thus substantially reducing frictional damage to the hose 20.

[0040] While various embodiments of the present invention have been described in detail, it is apparent that modifications and adaptations of those embodiments will occur to those skilled in the art. However, it is to be expressly understood that such modifications and adaptations are within the scope and spirit of the present invention, as set forth in the following claims.

What is claimed is:

1. A hose protection device, comprising:

a clamping mechanism that is adapted for selective interconnection to an end of a conduit, the clamp including an upper portion, which is adapted to be positioned adjacent to an outer surface of the conduit, and a lower portion, which is adapted to be positioned adjacent to an inner surface of the conduit;

a first upper support arm interconnected to the upper portion of said clamp;

a second upper support arm interconnected to the upper portion generally parallel to said first upper support arm;

a first lower support arm interconnected to the lower portion;

a second lower support arm interconnected to the lower portion generally parallel to said first lower support arm;

an upper roller rotatably interconnected to said first upper support arm and to said second upper support arm;

a lower roller rotatably interconnected to said first lower support arm and to said second lower support arm; and

wherein said upper roller and said lower roller are adapted to receive and support a hose a predetermined distance from the opening of the conduit thereby substantially preventing damage to the hose when it is moved into and extracted from the conduit.

2. The device of claim 1, further comprising:

a first middle support arm interconnected to a portion of said clamp that interconnects the upper portion to the lower portion;

a second middle support arm interconnected of said clamp that interconnects the upper portion to the lower portion generally parallel to said first middle support arm; and

a middle roller rotatably interconnected to said first middle support arm and to said second middle support arm.

3. The device of claim 1, wherein said first upper support arm and said second upper support arm each include an outer edge that are interconnected by a member to define a passage for a hose and prevent the hose from being moved away from said device in a radial direction relative thereto.

4. The device of claim 1, wherein said upper roller and said lower roller include a compliant material positioned around at least a portion thereof.

5. The device of claim 1, wherein said first upper support member and said second upper support member defines an upper support pair and said first lower support member and said second lower support member define a lower support pair, said upper support pair and said lower support pair being positioned at an angle relative to each other.

6. The device of claim 5, wherein said angle is less than 180 degrees.

7. The device of claim 1, further comprising a securing mechanism integrated into said upper portion of said clamp, said securing mechanism being adapted to engage the outside surface of the conduit.

8. The device of claim 7, wherein said securing mechanism is a threaded bolt.

9. A hose protection device, comprising:

a clamping mechanism that is adapted for selective interconnection proximate to an opening of a conduit;

at least one support arm comprising a first end and a second end, wherein said first end is interconnected to said clamping mechanism at a predetermined location and said second end extend beyond the opening of the conduit; and

an offset member interconnected to said least one support arm between said first end and said second end that is adapted to receive and support the hose at a predetermined distance from the opening of the conduit.

10. The device of claim 9, wherein the at least one support arm comprises a first support arm and second support arm that each include an outer edges that are interconnected by a member thereby defining a passage that is adapted to receive the hose and prevent the hose from being moved away from said device in a radial direction related thereto.

11. The device of claim 9, wherein the offset member is a roller rotatably interconnected to said at least one support arm.

12. The device of claim 9, wherein the offset member includes a compliant material.

13. The device of claim 9, wherein said at least one support member includes
a first upper support arm interconnected to the upper portion;
a second upper support arm interconnected to the upper portion generally parallel to said first upper support arm;
a first lower support arm interconnected to the lower portion;
a second lower support arm interconnected to the lower portion generally parallel to said first lower support arm; and

wherein said first upper support arm and said second upper support arm define an upper support member pair and said first lower support member and said second lower support member define a lower member support pair, said upper support member pair and said lower support member pair being positioned at an angle relative to each other.

14. The device of claim 13, wherein said angle is less than 180 degrees.

15. The device of claim 9, further comprising a securing mechanism integrated into said clamping mechanism, said securing mechanism being adapted to interface with an outside surface of the conduit.

16. The device of claim 15, wherein said securing mechanism is a screw.

17. The device of claim 9, wherein said offset member is a friction reducing means operably interconnected to said at least one support arm that is spaced at predetermined locations thereon, wherein said friction reducing means are adapted for engagement with a hose positioned within the conduit, and wherein the hose is adapted to travel on said plurality of friction reducing means and is substantially prevented from engaging an opening lip of the conduit.

18. A hose protection device adapted to orient a position of flexible hose during removal from a conduit, comprising:

a clamping means adapted for selective interconnection to an opening of the conduit;

at least one guide means having a first end and a second end, said first end interconnected to said clamping means while said second end extends beyond the opening of the conduit;
a hose engagement means operably interconnected to said at least one guide means that is adapted to receive and support the flexible hose a predetermined distance from the opening of the conduit.

19. The device of claim 18, wherein said clamping means includes:

an upper portion, which is adapted to be positioned adjacent to an outer surface of the conduit, and a lower portion, which is adapted to be positioned adjacent to an inner surface of the conduit.

20. The device of claim 18, wherein said at least one guide means is a first upper support arm interconnected to an upper portion of the clamping means;
a second upper support arm interconnected to the upper portion of the clamping means generally parallel to said first upper support arm;
a first lower support arm interconnected to a lower portion of the clamping means; and

a second lower support arm interconnected to the lower portion of the clamping means generally parallel to said first lower support arm.

21. The device of claim 18, wherein said hose engagement means is a roller.

22. The system of claim 21, wherein said roller includes a compliant material.

23. The system of claim 18, wherein said clamping means further comprises a securing means that is adapted for engagement with the outside of the conduit.

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