



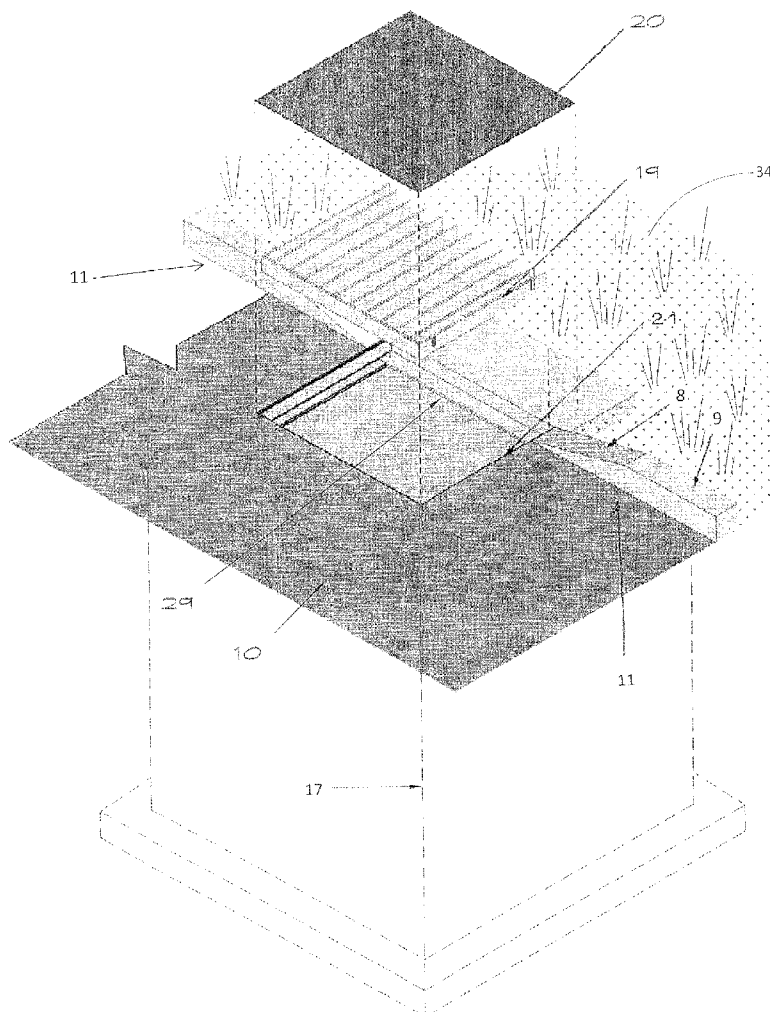
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(19) **United States**(12) **Patent Application Publication**
THOMAS(10) **Pub. No.: US 2016/0024778 A1**(43) **Pub. Date: Jan. 28, 2016**(54) **RETROFIT CATCH BASIN FOR USE IN
STORM WATER MANAGEMENT PRACTICE****Publication Classification**(71) Applicant: **Kyle Emmett THOMAS**, Syracuse, NY
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3, 2012, now Pat. No. 9,127,448.(51) **Int. Cl.***E03F 5/12* (2006.01)*E03F 5/042* (2006.01)*E03F 3/04* (2006.01)*E03F 5/06* (2006.01)*E03F 1/00* (2006.01)(52) **U.S. Cl.**CPC . *E03F 5/125* (2013.01); *E03F 5/06* (2013.01);*E03F 1/005* (2013.01); *E03F 3/043* (2013.01);*E03F 5/042* (2013.01)

(57)

ABSTRACT

A catch basin retrofit that allows stormwater to be diverted from an existing storm sewer to an alternative stormwater management practice (SMP), while maintaining functionality of the catch basin as an overflow device for the alternative SMP.



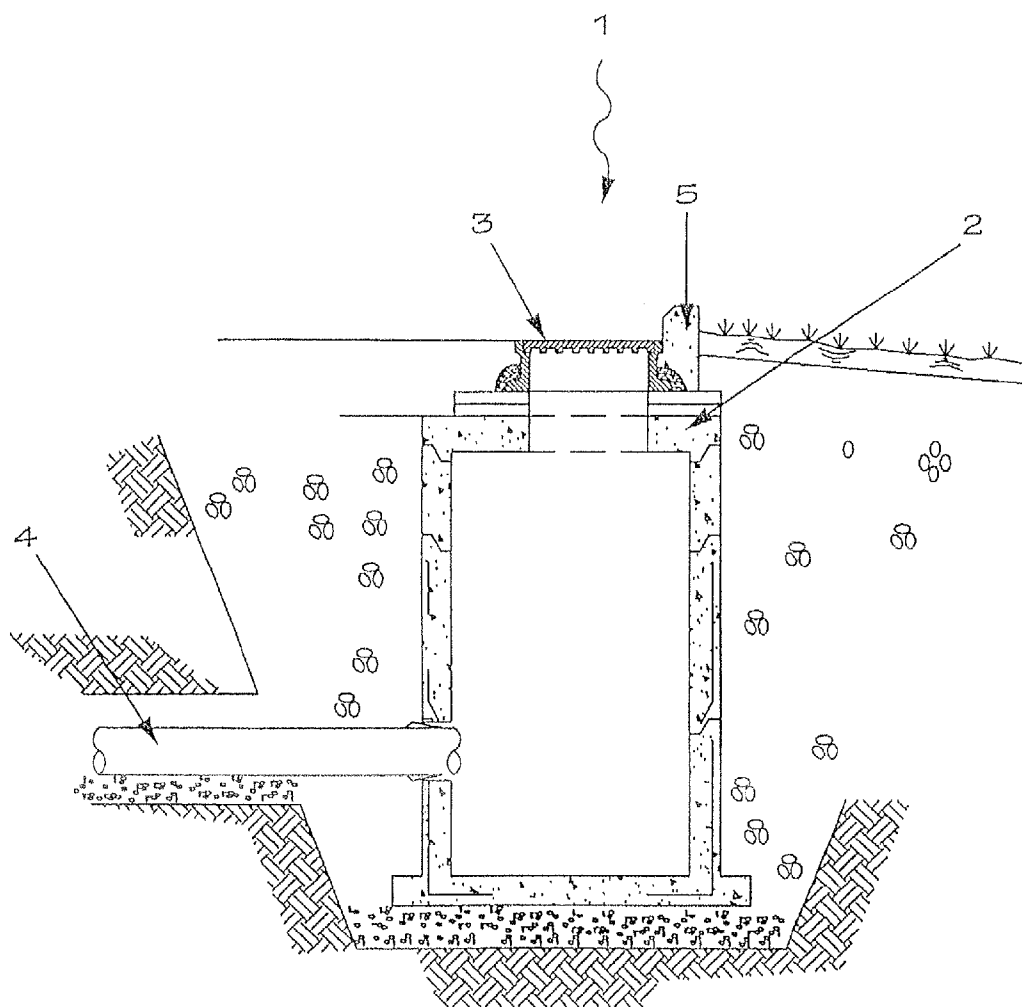


FIG. 1

PRIOR ART

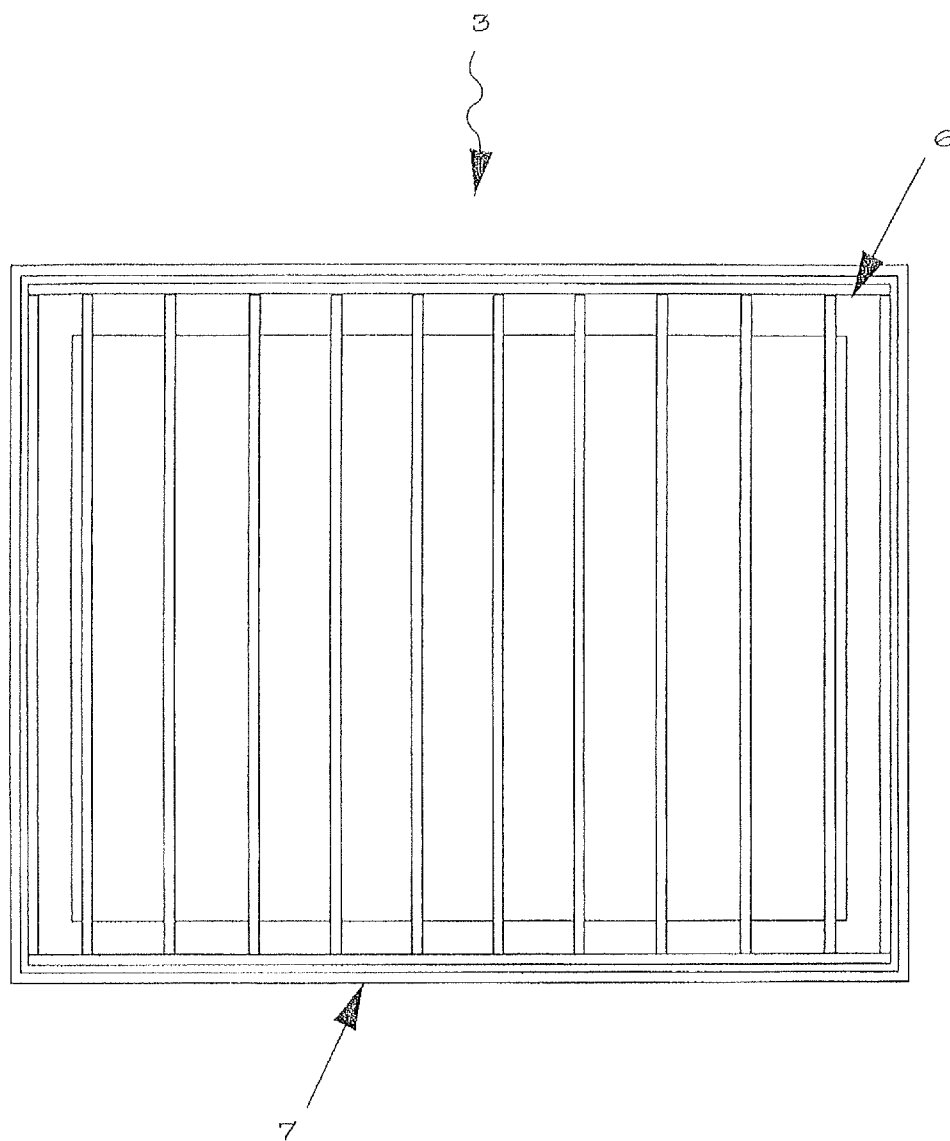


FIG. 2

PRIOR ART

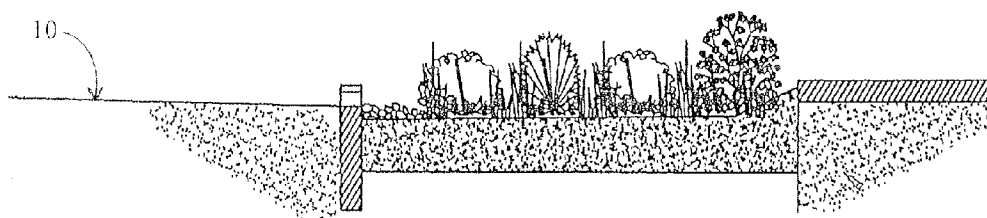


FIG. 3 PRIOR ART

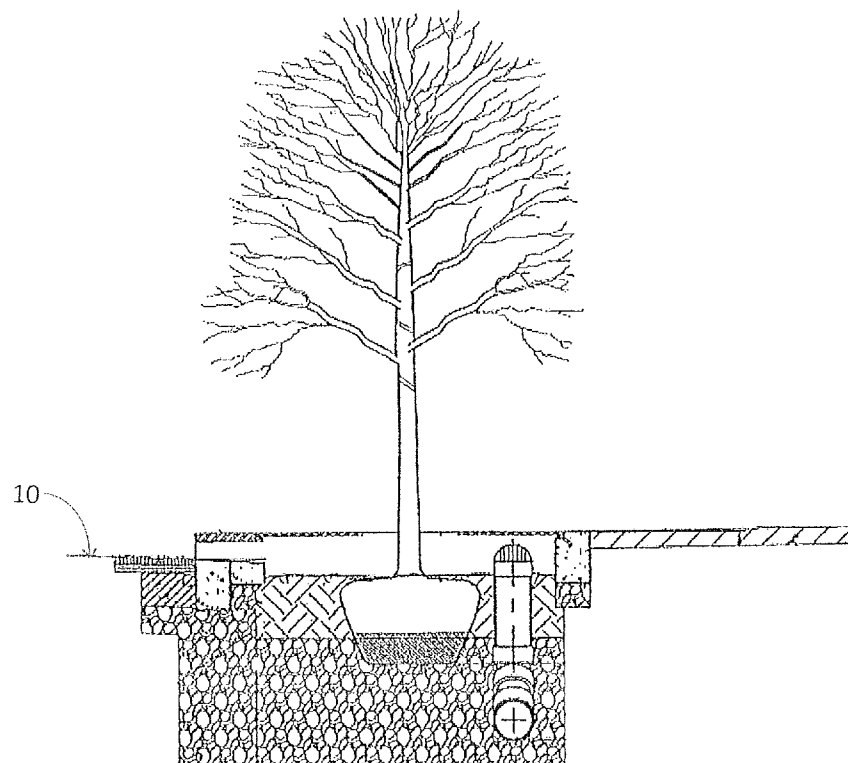


FIG. 4

PRIOR ART

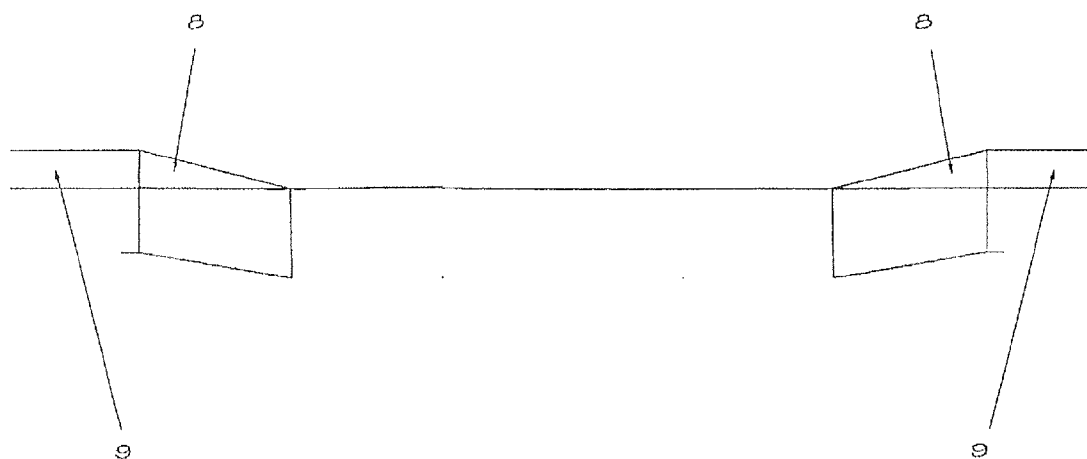


FIG. 5

PRIOR ART

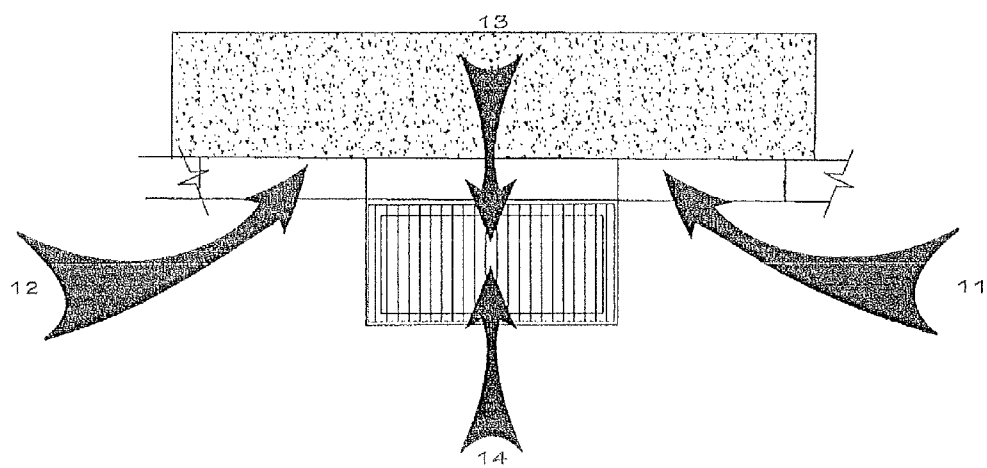
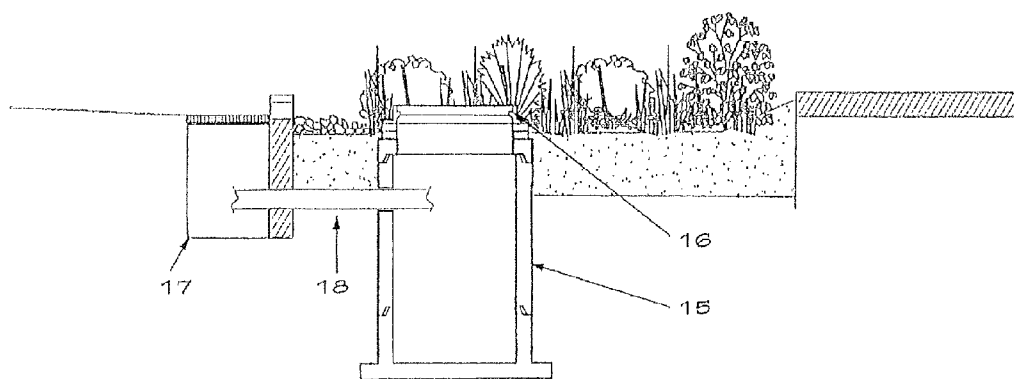


FIG. 6

PRIOR ART



PRIOR ART

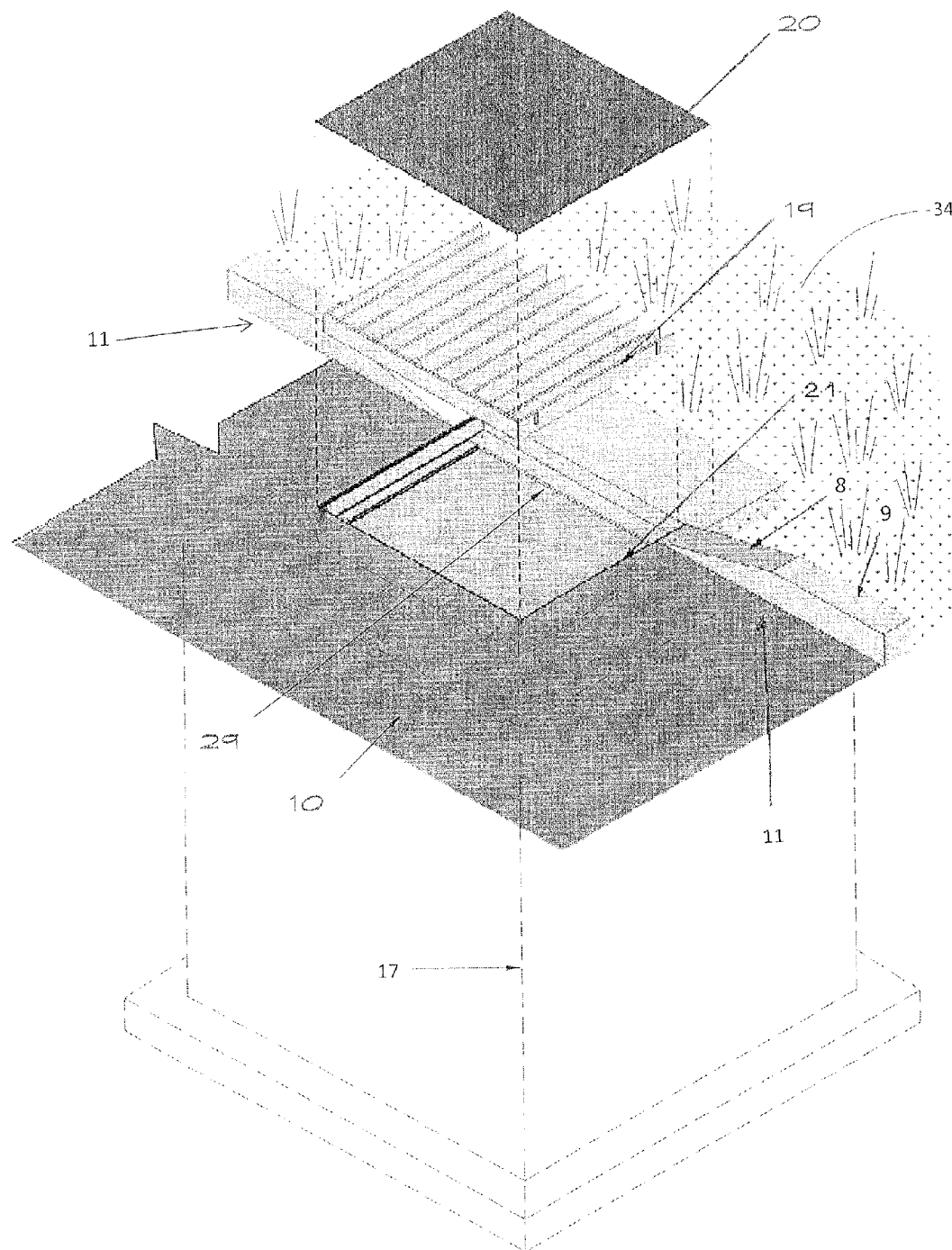


FIG. 8

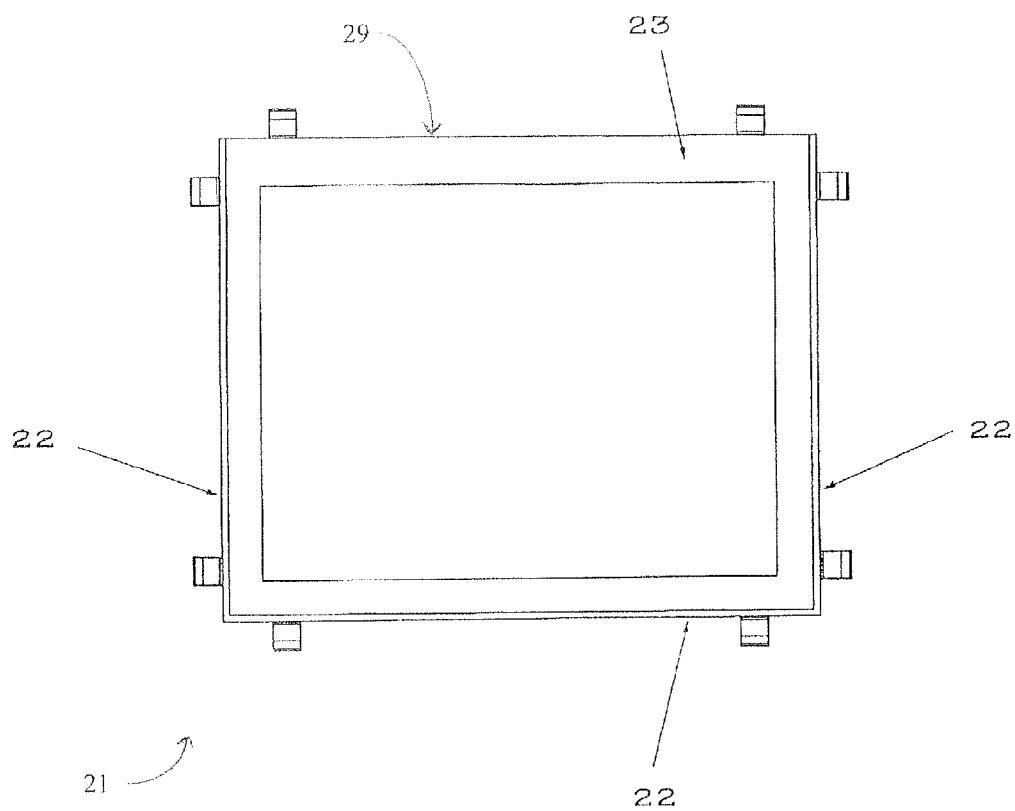


FIG. 9

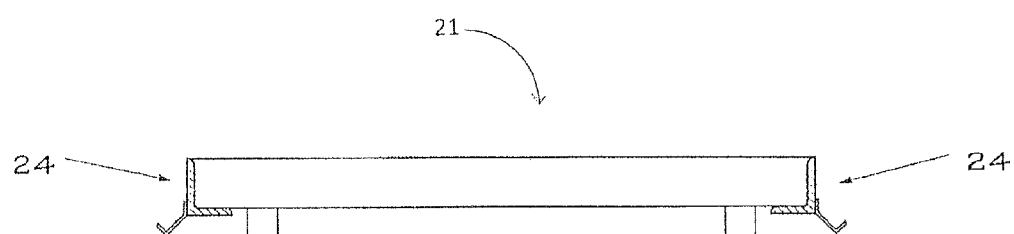


FIG. 10

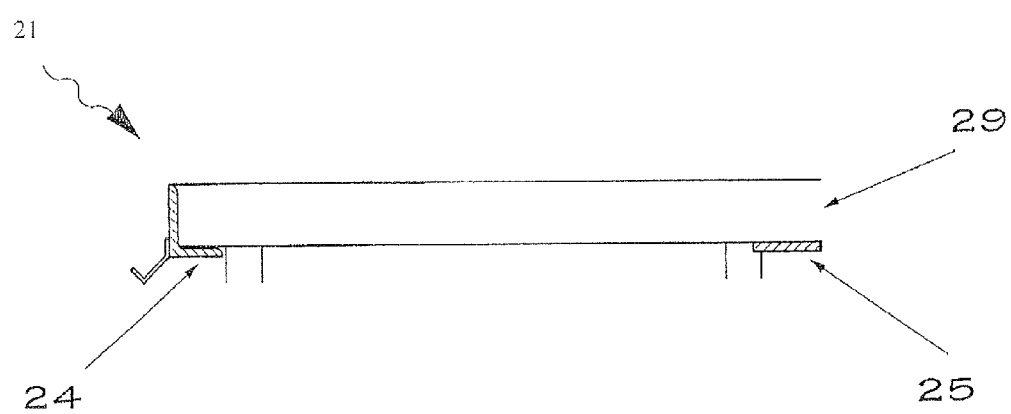


FIG. 11

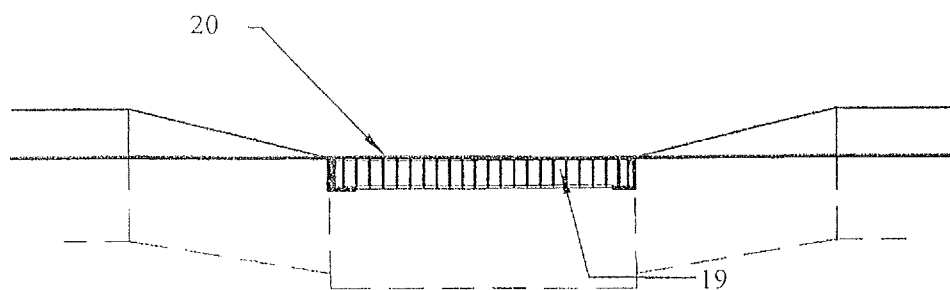


FIG. 12

RETROFIT CATCH BASIN FOR USE IN STORM WATER MANAGEMENT PRACTICE

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application is a division of U.S. patent application Ser. No. 13/691,869, filed Dec. 3, 2012, the entirety of which is incorporated herein by reference.

FIELD OF THE INVENTION

[0002] The present invention relates to the field of stormwater management. More particularly, the present invention is an adaptation to existing conventional stormwater infrastructure to retrofit for an alternative stormwater management practice (SMP). The present invention is particularly applicable where more modern “green infrastructure” technologies are being incorporated into existing urban drainage systems.

BACKGROUND OF THE INVENTION

[0003] Urban stormwater management has historically involved collection of rainwater and conveyance via piping either directly to receiving waters or through via wastewater treatment plants (WWTPs). In dozens of cities in the United States such conveyance has occurred through combined sewer systems (CSSs), which convey both stormwater and sewage to WWTPs. Such CSSs are typically equipped with overflow devices that allow discharge directly to receiving waters from the sewer system when the sewer capacity is exceeded. Such combined sewer overflow (CSO) events contain not only stormwater but also untreated human and industrial waste, toxic materials, and debris. They are a major water pollution concern for the approximately 772 cities in the U.S. that have these CSSs.

[0004] Many communities, including New York, N.Y.; Philadelphia, Pa.; Kansas City, Mo. and Syracuse, N.Y. are implementing green infrastructure (“GI”) techniques. GI is an approach that communities can choose to maintain healthy waters, provide multiple environmental benefits and support sustainable communities. Unlike single-purpose gray stormwater infrastructure, which uses pipes to dispose of rainwater, green infrastructure uses vegetation and soil to manage rainwater where it falls. By weaving natural processes into the urban constructed environment, green infrastructure provides not only stormwater management, but also flood mitigation, air quality management, and more. It is important to note that GI is a volume-based approach to stormwater management, not typically amenable to managing peak flows associated with storm events. Thus, where GI is being incorporated into urban infrastructure, it is usually required by the locality to incorporate an overflow outlet to provide for drainage during extreme events.

[0005] A component of conventional “gray” stormwater management systems for conveying street runoff to sewer systems are often street side catch basins 1 an example of which is depicted on FIG. 1. As will further be seen in FIG. 1 these systems consist of an underground constructed sump 2 covered by a traffic-rated frame and grate 3 an outlet pipe 4 connected to a sewer system. Stormwater enters the catch basin via gravity either as sheet-flow from the street, or is conveyed along the adjoining curb 5 as can be seen in FIG. 1. An example of the prior art frame and grate assembly 3 is depicted on FIG. 2. In FIG. 2, the assembly typically consists

of a traffic-rated grate 6 that allows stormwater to enter the catch basin with the slats of the grate serving to screen the waters of “floatables” (i.e. large floating materials) that would otherwise enter the catch basin. The slats of the grate are directed orthogonal to the direction of traffic, which in combination with its construction to meet vehicle traffic standards, allows vehicular traffic to pass over safely and without damage to the device. The grate is set inside a compatible, traffic-rated frame 7, as shown in FIG. 2, that positions and mounts the assembly to the catch basin sump and the surrounding road and curb. Because the device operates by gravity, the catch basin is typically positioned at a locally minimum elevation in the road segment or city block.

[0006] A common GI technique to managing street runoff is through the use of street-side bioretention or tree boxes, as is depicted in FIGS. 3 and 4. These techniques usually require the use of constructed curb inlets, as shown in FIG. 5, consisting of transitions 8 from granite curbing 9 to form an opening in the curb 9 that allows water from the street 10 to enter the GI measure located on the opposite side of the curb 9. The GI measure is also typically equipped with overflow devices to allow storm events to be diverted from the GI measure to the storm sewer system. Where these techniques are being adapted to existing urban drainage conditions, curb inlets and overflow devices are necessarily constructed as retrofits to the existing infrastructure. Construction of such overflow devices is typically a costly, invasive endeavor involving setting and plumbing of pre-cast or other manufactured overflow catch basins, plumbed into existing sewer systems located in the public street or right-of-way as discussed below.

[0007] Because, as discussed above, the location of stormwater catch basins are configured at low points in the streetscape in order to effectively capture stormwater runoff via gravity, retrofit curb inlets might be positioned on each side of the existing catch basin. This design allows effective capture of flow along the curbline 11 and 12 to the existing catch basin as is exemplified in FIG. 6. As discussed above, a mechanism for managing overflows is a necessary component of these GI measures and this is accomplished under this curb inlet configuration by maintaining the existing streetside catch basin in place so that water may back up and out of the bioretention area 13 into the catch basin during extreme storm events. This configuration does not, however, optimize stormwater collection as water that routes directly to the plane of the catch basin from the street 14 (i.e. not along the curbline) will continue to enter the catch basin and thus the sewer during rain events.

[0008] An alternative design involves the decommissioning and replacement of the existing catch basin with a curb inlet. This configuration effectively captures all runoff (for purposes of this invention, runoff, storm-water runoff and street runoff will be used interchangeably as would be understood by those skilled in the art) to the existing catch basin, up to the retentive capacity of the SMP, but a new overflow structure is required to accommodate runoff exceeding design events. An example of this prior art is shown on FIG. 7. Such overflow structures are often precast structures 15 equipped with a slotted opening 16 serving as the overflow entry weir, which must be plumbed into the existing storm sewer 17 system with underground pipes 18.

SUMMARY OF THE INVENTION

[0009] While the aforementioned prior art catch basin designs and associated collection frames and grate fulfill certain objectives and requirements, a need exists for a more efficient, less expensive means for retrofitting such existing catch basins/rack and grate systems for adoption of alternative SMPs, particularly as it relates to GI. In one aspect, the current invention seeks to solve the problems associated with the prior art by utilizing a rack and covered grate assembly that will effectively divert runoff to a GI measure through a common curb inlet structure while allowing the existing catch basin to serve as an overflow device, and that also screens debris from the catch basin as effectively as the replaced system. In one aspect, the benefit of the current invention is the avoided cost of the dedicated additional overflow structure and the greater efficiency of collection of the curb inlet.

[0010] In the various figures, the prior art and SMP/GI technologies are illustrated as well as the exemplary features of the invention are demonstrated so that the detailed description that follows may be better understood, and that the present contribution to the art may be better appreciated. There are additional features of the invention that will be described hereinafter and which will form the subject matter of the claims appended hereto. In no way should the following figures and examples limit the scope of the invention as would be understood and appreciated by those skilled in the art. It will be understood that the aforementioned references are incorporated by reference.

BRIEF DESCRIPTION OF THE FIGURES

[0011] FIG. 1 shows a cross sectional view of a typical urban street side catch basin with associated horizontal rack and grate assembly.

[0012] FIG. 2 is a plan view of a detailed drawing of a catch basin frame and rack assembly.

[0013] FIG. 3 shows a cross sectional view of a curbside bioretention area that might be used for management of runoff from an urban roadway.

[0014] FIG. 4 is an exemplary representation of a “tree box,” with a similar function for stormwater management.

[0015] FIG. 5 is a cross sectional view of a typical curb inlet used to divert runoff to street/curbside SMP.

[0016] FIG. 6 is a plan view of a possible curb inlet configuration retrofitted around an existing stormwater catch basin.

[0017] FIG. 7 is a profile view of the prior art pre-cast concrete overflow structure.

[0018] FIG. 8 is an exploded, axinometric representation of the catch basin and diversion assembly, including trash screen, cover plate and structural frame as envisioned by the current invention.

[0019] FIG. 9 is a plan view of the exemplary invention as installed.

[0020] FIG. 10 is a profile view of the exemplary invention oriented along its longitudinal axis.

[0021] FIG. 11 is a profile view of the exemplary invention oriented along its lateral axis.

[0022] FIG. 12 is a profile view illustrating a grate and cover of an exemplary stormwater diversion and overflow device as appearing to an observer looking from an SMP toward the street.

DETAILED DESCRIPTION

[0023] FIG. 8 shows an exemplary embodiment of a stormwater diversion and overflow device. An exemplary assembly of the diversion and overflow device generally consists of a grate **19** and cover plate **20** set in a frame **21**. The grate **19** and frame **21** portion of the assembly is typical of a stormwater collection and trash screen device, as represented in FIG. 2 and as is readily understood by those skilled in the art, but with differences as discussed in the following passages.

[0024] FIG. 9 depicts the frame **21** portion of the stormwater diversion and overflow device in plan view. With reference to FIG. 8 and FIG. 9, it can be seen that on three sides, the frame **21** is similar to the prior art catch basin frame by the presence of angle members forming much of the strength of the assembly. Each angle member comprises a vertical member **22** and a horizontal member **23**. The invention is distinguished, in part, from the conventional frame by the absence of the vertical member **22** from the angle member forming the curbside edge **29** of the frame **21**. This portion of the frame **21** consists of the horizontal member **23** only. The absence of the vertical portion **22** of the curbside angle member will allow the stormwater diversion and overflow device to serve its overflow function by allowing flow to pass from the SMP to the existing catch basin beneath the cover plate of the invention via the curb inlet.

[0025] FIG. 10 depicts the frame **21** portion of the stormwater diversion and overflow device in profile view. The invention members shown are the angle members **24** of the frame **21**, with the frame **21** oriented along the curbline. For purposes of clarity, one of skill in the art will understand that “curbline” and “curbside edge” can be used interchangeably.

[0026] FIG. 11 depicts a second profile view of the frame **21** portion of the stormwater diversion and overflow device with the angle member **24** which has both a vertical member **22** and a horizontal member **23**, located on the street-side of the invention, and the angle member **25**, which has a horizontal member **23** but no vertical member **22**, located on the curbside edge **29** of the invention abutting the curb inlet.

[0027] FIG. 12 shows the grate **19** and cover plate **20** of the stormwater diversion and overflow device in profile as it would appear to an observer looking from the SMP toward the street. With reference to FIG. 8 and FIG. 12, the grate **19** and cover plate **20** are discussed. Similar to the frame **21** portion of the stormwater diversion and overflow device described above, the grate **19** of the stormwater diversion and overflow device is distinguished from a conventional grate by the absence of curbside lateral edge that would otherwise contact the curbside edge of the frame. Again similar to the adaptation for the frame **21** described above, the absence of a vertical edge parallel to the curb will allow the stormwater diversion and overflow device to serve its overflow function by allowing flow to pass from the SMP to the existing catch basin beneath the cover plate **20** of the invention via the curb inlet. Grate slats **27** oriented normal to the plane of the curb and extending over the lateral curbside edge **29** of the frame **21** will function as the trash screen, the functional equivalent of the grate associated with the conventional catch basin grate (FIG. 2). The cover plate **20** of the stormwater diversion and overflow device extends beyond the grate **19** and frame **21** as necessary and over the curb inlet threshold in order to effectively divert runoff to the SMP. The runoff occurs as sheet-flow, which is important to the functionality of vegetated GI such as a bioretention area.

[0028] Of course it will be understood by those skilled in the art that the slots in the grate can be of differing dimensions and spacing depending on the screening objectives, and that the frame, grate and cover can be constructed of different materials including but not limited to steel, galvanized steel, iron, galvanized iron, aluminum, or synthetic materials such as polyvinyl chloride (PVC). It will also be understood by those skilled in the art that cover can be extended varying lengths into the SMP and equipped with a drip edge or other appurtenances to effect proper flow or to dissipate energy as flow occurs from the invention to the SMP. It will further be understood by those skilled in the art that the invention may be of different sizes and configurations to adapt to the many various designs of stormwater catch basins whether they may be located directly under the stormwater frame and grate as described above, or adjoining the assembly, located adjacent to the street or lot.

[0029] Referring back to the exemplary embodiment of FIG. 8, a catch basin diversion system 30 is depicted wherein an existing street-side catch basin 17 is retrofitted with the stormwater diversion and overflow device so that stormwater, instead of entering the catch basin 17 and then the public sewer system, is diverted via a cover plate 19 to an alternative SMP 34 (e.g., the bioretention area or tree box of FIGS. 3 and 4). The cover plate 20 is situated above the level of the curb inlet (FIG. 5) elevation by a grate 19 that both provides the opening to the catch basin 32 so that backflow to the catch basin 17 from the SMP 34 (FIGS. 3 and 4) can occur during overflow events, and prevents floatables and other debris from entering the catch basin 17.

[0030] As conventional catch basin frame and grate assemblies are pre-manufactured in standard sizes, so would the claimed invention be fabricated to a number of common dimensions. The retrofit of existing installations would be performed by simply lifting out the existing assembly then placing the claimed invention while constructing the curb inlet.

1. A method of installing a stormwater diversion and overflow device, the method comprising replacing a frame and grate functioning as an opening for stormwater runoff to enter a catch basin with the stormwater diversion and overflow device to divert stormwater runoff to an alternative stormwater management practice device and redirect excess stormwater runoff exceeding the capacity of the alternative stormwater management practice device back to the catch basin, the stormwater diversion and overflow device comprising:

a diversion and overflow frame; and

a diversion and overflow cover,

the frame comprising a perimeter member having a first portion extending less than 360 degrees around a perimeter of the frame, the perimeter member at least partially defining an opening through which fluid can flow,

the cover extending beyond the frame on at least one side an amount sufficient to carry stormwater runoff to a storm water management practice system,

the cover bounding the opening, the opening configured to allow stormwater to pass from the stormwater management practice system to the catch basin.

2. The method of claim 2, wherein the stormwater diversion and overflow device further comprises an overflow grate, the overflow grate comprising:

a vertical portion which comprises at least a portion of a perimeter of the grate; and

at least one slat extending from a first end connected to the vertical portion to a second, unconnected end,

the vertical portion at least partially defining the opening.

3. A stormwater diversion and overflow device, the device comprising:

a grate assembly,

the grate assembly comprising a grate and a cover,

the grate having a first side, a second side opposing the first side, a volume between the first side and the second side, and a perimeter member between the first side and the second side, the perimeter member surrounding the volume, the perimeter member defining at least a first opening extending through the grate from the first side to the second side, at least one of the at least a first opening extending through a portion of the perimeter member,

the cover being directly on the first side of the grate and bounding each at least a first opening on the first side of the grate,

the cover bounding at least a portion of each at least a first opening where each at least a first opening extends through the portion of the perimeter member of the grate.

4. The stormwater diversion and overflow device of claim 3, wherein said stormwater diversion and overflow device is retrofitted to an existing street-side catch basin.

5. The stormwater diversion and overflow device of claim 3, wherein the grate assembly further comprises a horizontal member, the horizontal member oriented parallel to the cover, the horizontal member adjacent to the opening.

6. The stormwater diversion and overflow device of claim 3, wherein the cover comprises a plate.

7. The stormwater diversion and overflow device of claim 3, wherein the device further comprises a structural frame into which the grate assembly is configured to set.

8. The stormwater diversion and overflow device of claim 7, wherein the grate is in the structural frame and the cover extends beyond the grate and the structural frame.

9. The stormwater diversion and overflow device of claim 3, wherein the grate comprises grate slats.

10. The stormwater diversion and overflow device of claim 3, wherein the cover is equipped with a drip edge to facilitate distribution of flow off the cover.

11. A stormwater diversion and overflow device, the device comprising:

a frame comprising an angle member having a first portion and a second portion, the second portion oriented at an angle to the first portion, the first portion defining an opening through a perimeter of the frame; and

a cover,

the cover support by the frame,

the cover extending beyond the frame and extending beyond the opening in a direction toward which the opening faces an amount sufficient to carry stormwater runoff to a stormwater management practice system.

12. The stormwater diversion and overflow device of claim 11, wherein the first portion is oriented substantially perpendicular to the cover.

13. The stormwater diversion and overflow device of claim 11, wherein the second portion of the angle member is oriented substantially parallel to the cover, the second portion being connected substantially perpendicular to the first portion.

14. The stormwater diversion and overflow device of claim **11**, wherein the second portion of the angle member extends 360 degrees around the perimeter of the frame.

15. The stormwater diversion and overflow device of claim **13**, wherein the second portion of the angle member comprises an extension on each of four sides of the perimeter of the frame, each extension being substantially perpendicular to each adjacent extension.

16. The stormwater diversion and overflow device of claim **11**, wherein the perimeter of the frame has four sides, the first portion of the angle member extending on three sides of the perimeter of the frame, defining the opening on the fourth side of the perimeter of the frame.

17. The stormwater diversion and overflow device of claim **11**, wherein the device further comprises a grate supported by the frame, the grate adjacent to the cover, the grate further comprising:

a first member; and

a plurality of parallel slats having a first end and a second end, the parallel slats extending from the first member at the first end, at least one of the slats remaining free and unconnected at the second end.

18. A catch basin diversion system, the system comprising: the stormwater diversion and overflow device recited in claim **11**, the stormwater diversion and overflow device being installed in a street;

a catch basin under the street; and

an alternative stormwater management practice positioned adjacent to and off the street.

* * * * *