



US 20050247612A1

(19) **United States**

(12) **Patent Application Publication**
Glassheim

(10) **Pub. No.: US 2005/0247612 A1**

(43) **Pub. Date: Nov. 10, 2005**

(54) **SILT AND DEBRIS FILTERING SYSTEM
FOR STORM DRAINS**

Related U.S. Application Data

(60) Provisional application No. 60/563,736, filed on Apr. 20, 2004.

(76) Inventor: **Robert Glassheim, Bradley Beach, NJ
(US)**

Publication Classification

(51) **Int. Cl.⁷ E03F 5/06**

(52) **U.S. Cl. 210/163; 404/4**

Correspondence Address:

PLEVY & HOWARD, P.C.

P.O. BOX 226

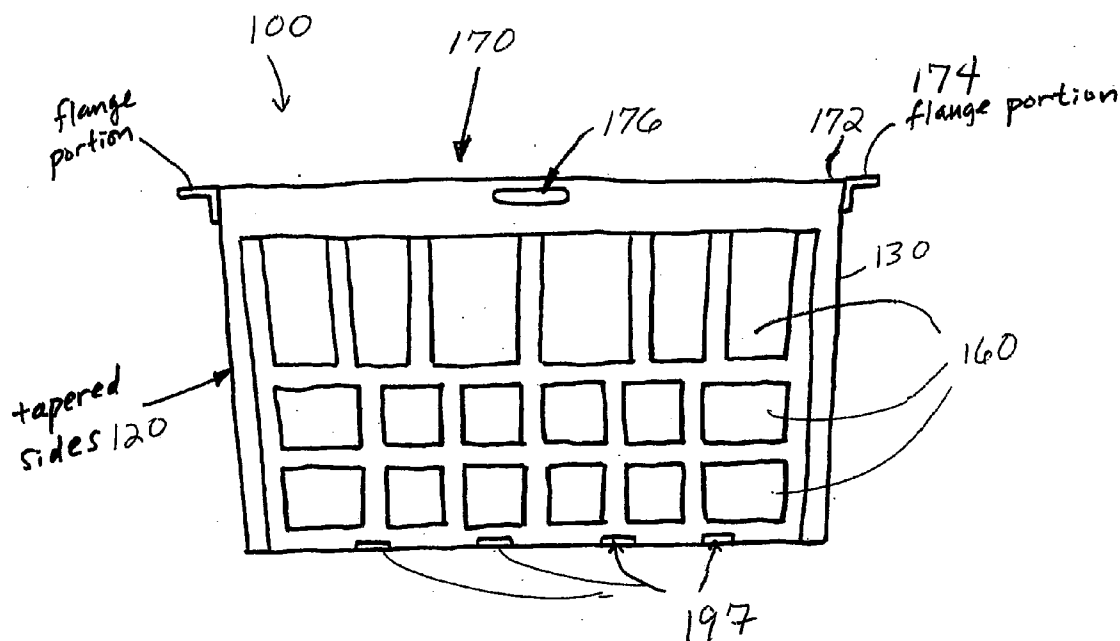
FORT WASHINGTON, PA 19034 (US)

(57) **ABSTRACT**

An apparatus for removing debris from water passing through a storm drain comprises a frame adapted to be positioned underneath a storm grate for receiving the water, the frame having a bottom side and major and minor sidewalls, the major sidewalls having openings therein for allowing water to pass; and a filter removably insertable along at least a portion of the major sidewalls for filtering debris from the water.

(21) Appl. No.: **11/110,649**

(22) Filed: **Apr. 20, 2005**



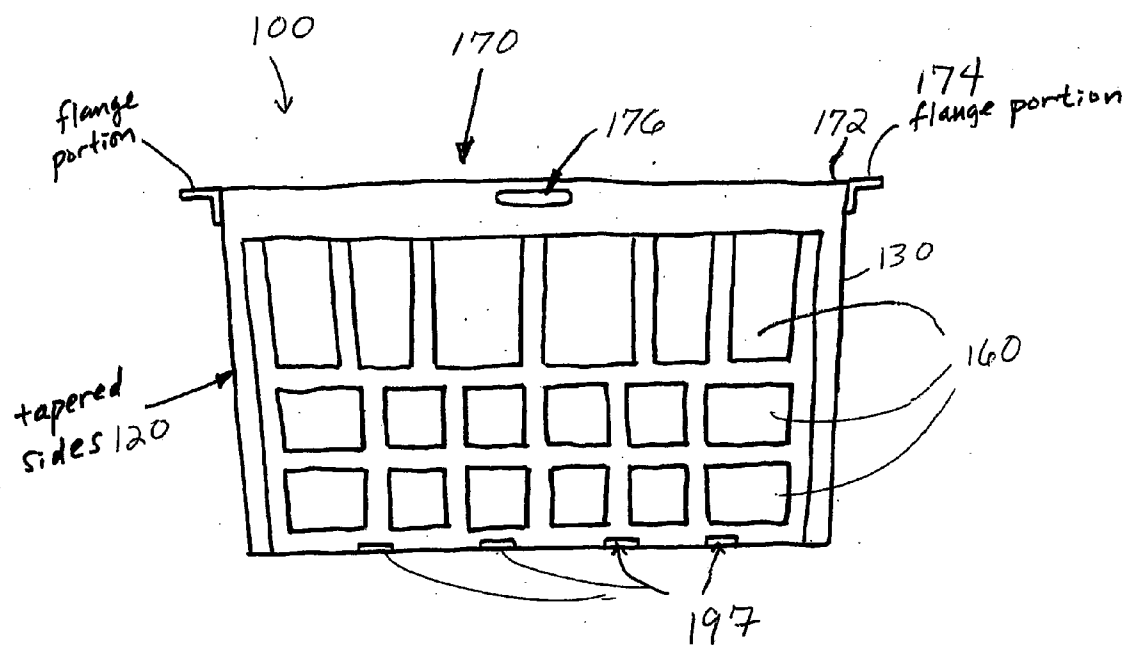


Fig. 1A

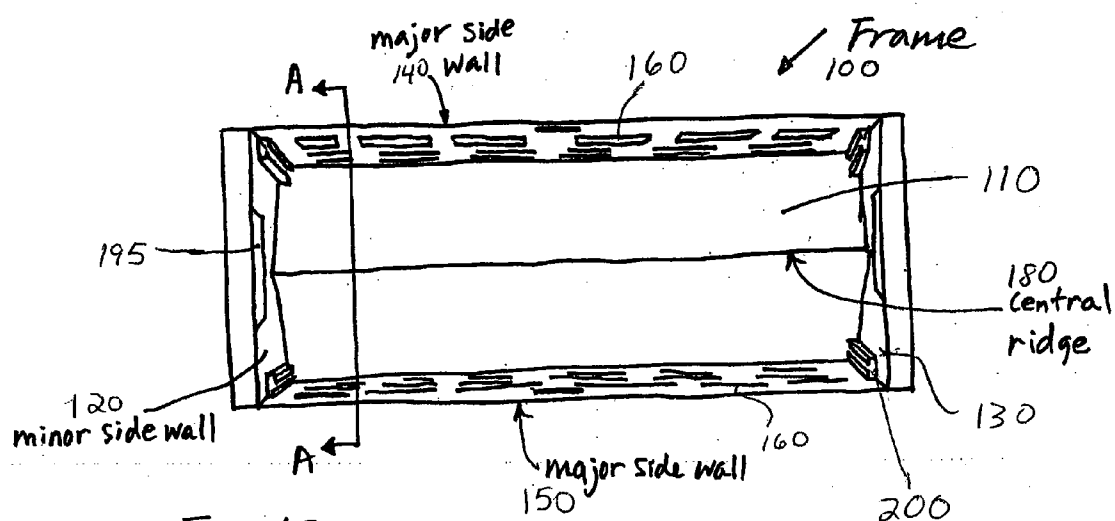


Fig. 1B

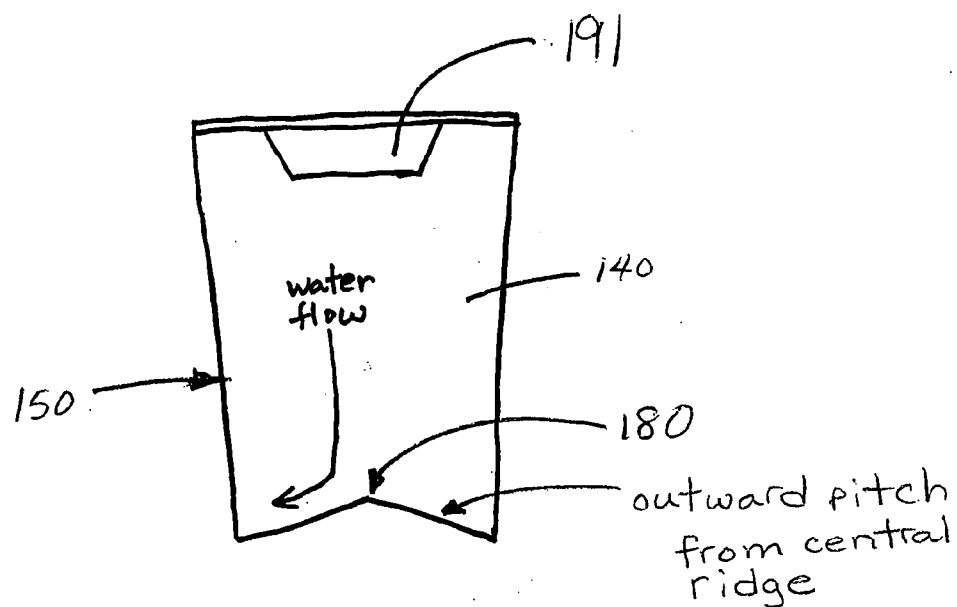


Fig. 1C

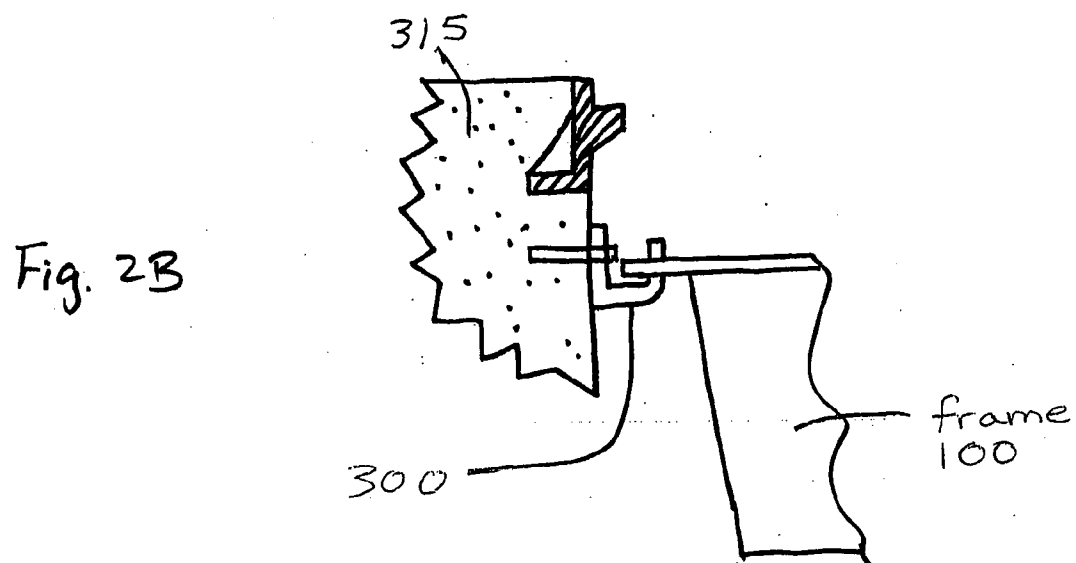


Fig. 2B

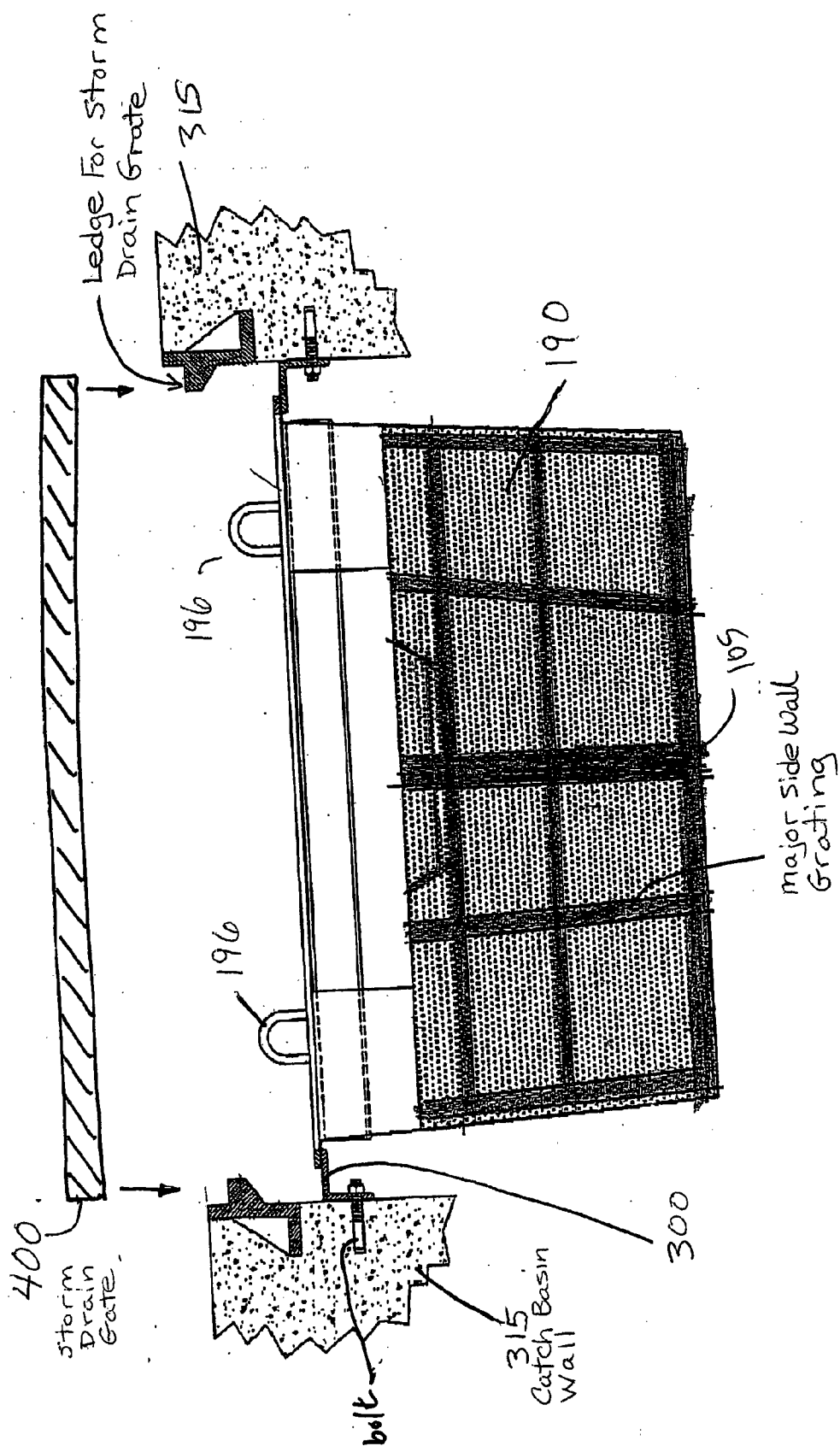


Fig. 2A

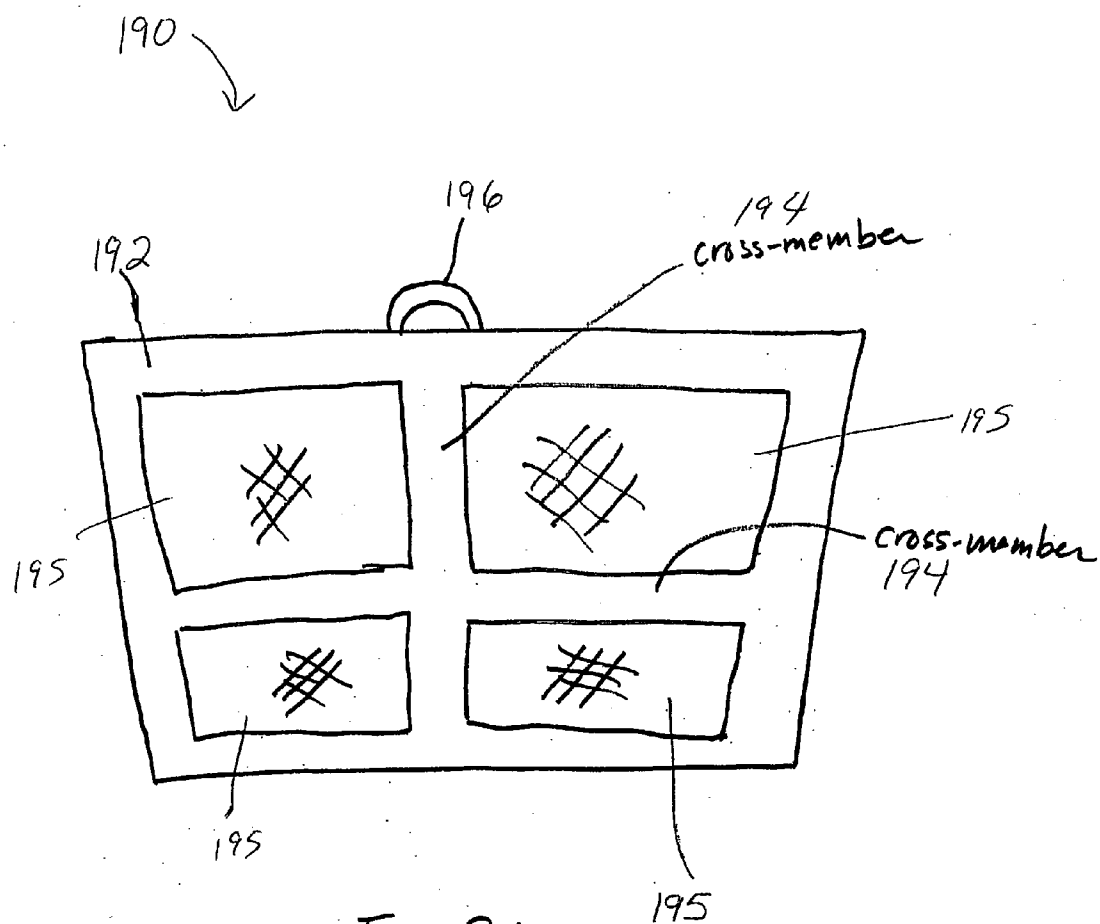


Fig. 3A

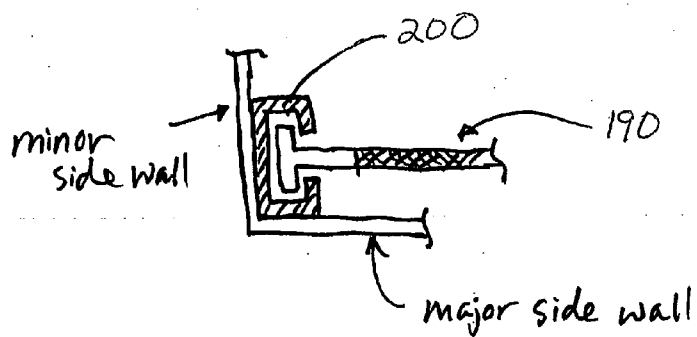


Fig. 3B

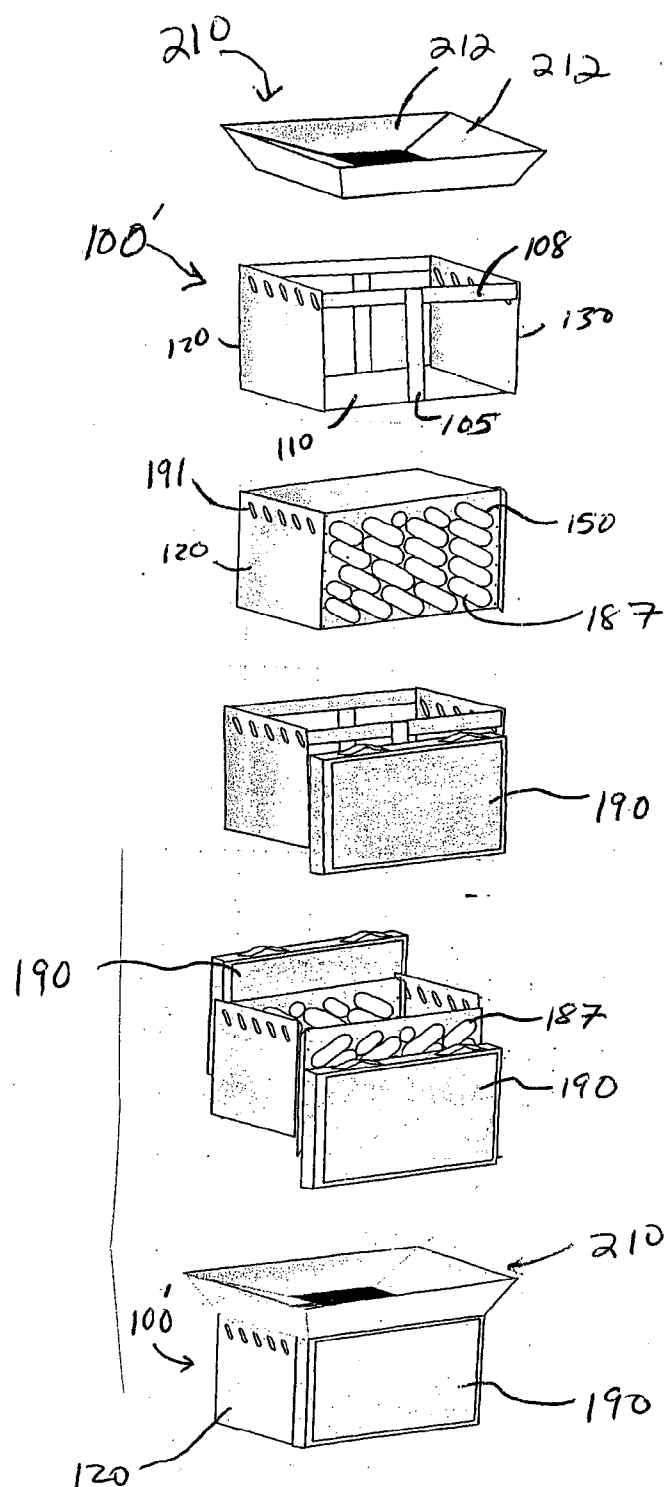
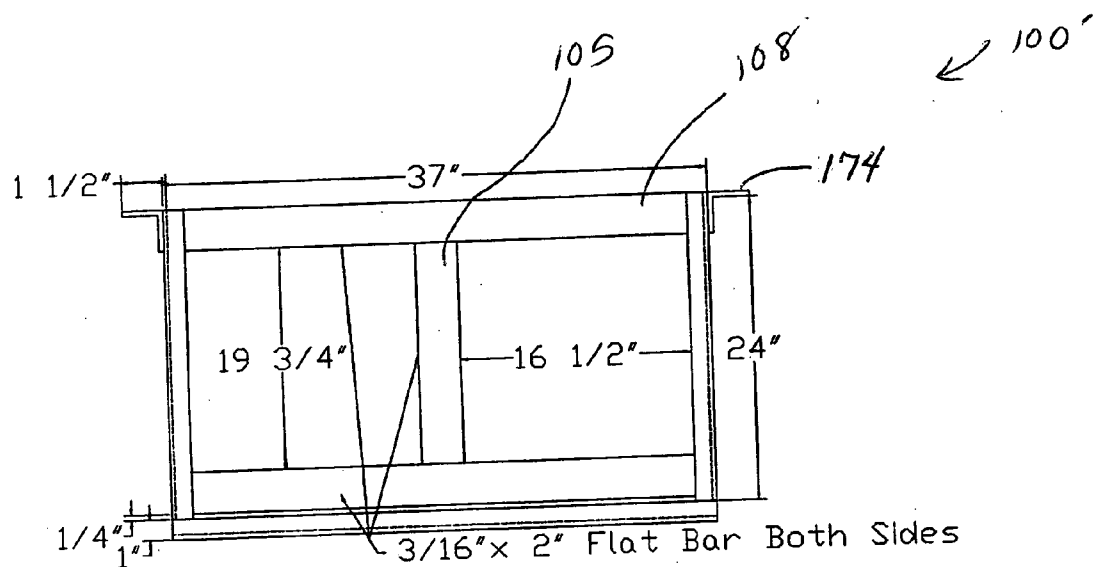
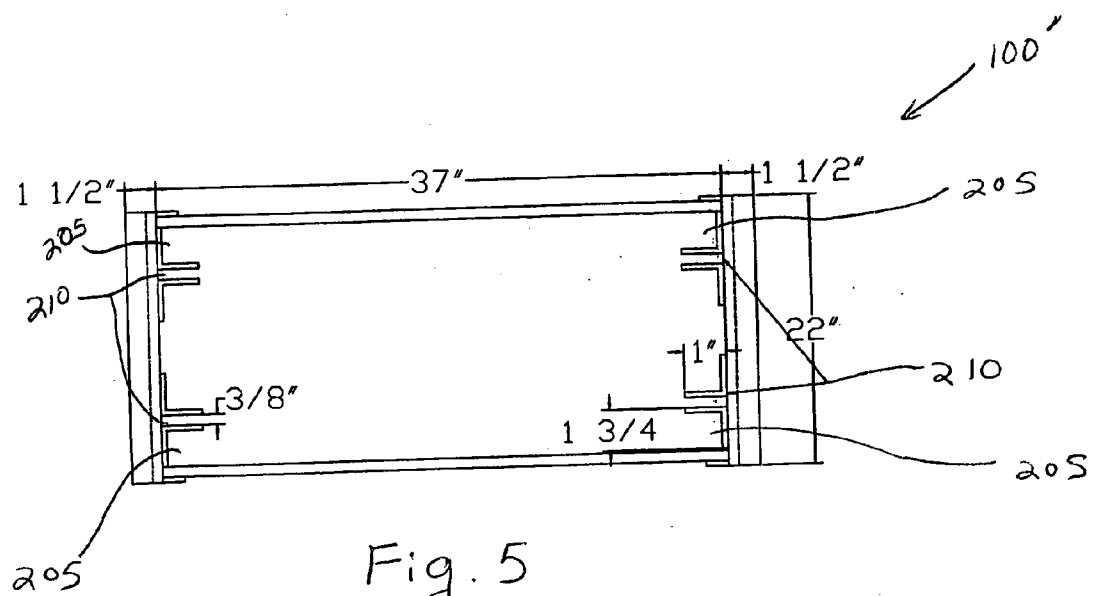


FIG. 4



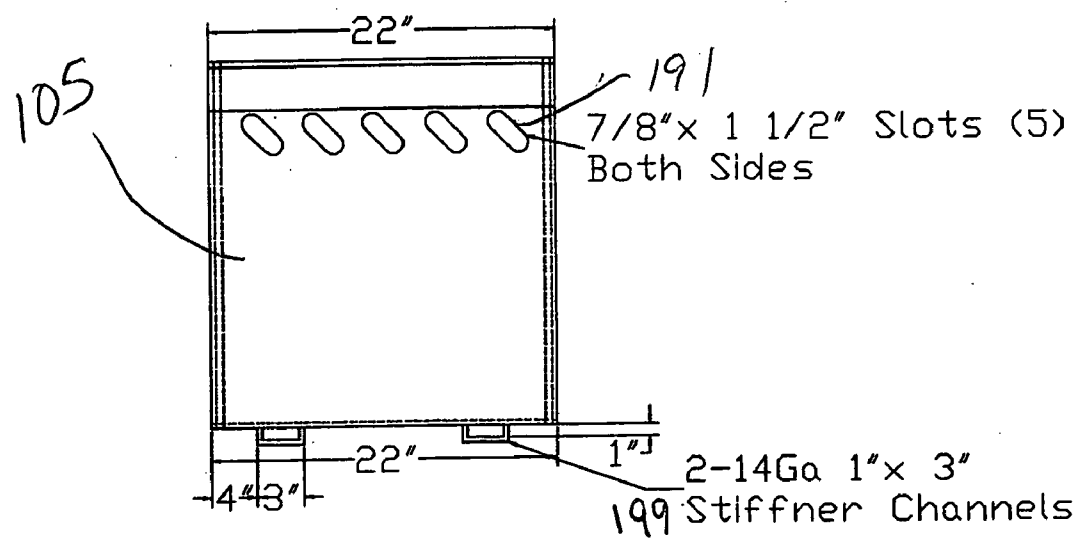


FIG. 7

SILT AND DEBRIS FILTERING SYSTEM FOR STORM DRAINS

RELATED APPLICATION

[0001] This application claims priority of U.S. Patent Application Ser. No. 60/563,736, entitled Silt And Debris Filtering System For Storm Drains, filed Apr. 20, 2004, the entire disclosure of which is hereby incorporated by reference as if being set forth in its entirety herein.

FIELD OF THE INVENTION

[0002] The present invention generally relates to a storm drain filter system for filtering water flowing into a storm drain.

BACKGROUND OF THE INVENTION

[0003] Filtering systems useful for storm drains generally prevent silt and other debris (e.g., dirt, gravel, tree leaves, street trash, etc.) from entering the storm drain and sewer system. Silt and other debris entering the storm drains along with rainwater and other surface water run-offs may clog the storm sewers and cause street flooding and/or damage to water treatment facilities that treat the water from storm sewers. Such problems may be exaggerated and commonly found in many construction sites or similar locations.

[0004] To prevent such problems, the inventor has invented a novel silt and debris filtering system for storm drains that is simple to install and easy to maintain. The filter system of the present invention is provided with filter units that are easily removed from the storm drains for cleaning or replacement.

SUMMARY OF THE INVENTION

[0005] An apparatus for removing debris from water passing through a storm drain comprises a frame adapted to be positioned underneath a storm grate for receiving the water, the frame having a bottom side and major and minor sidewalls, the major sidewalls having openings therein for allowing water to pass; and a filter removably insertable along at least a portion of the major sidewalls for filtering debris from the water.

BRIEF DESCRIPTION OF THE FIGURES

[0006] FIG. 1A illustrates a side view along a major side of a storm drain filter system according to an embodiment of the present invention;

[0007] FIG. 1B illustrates a top view of the storm drain filter system of FIG. 1A;

[0008] FIG. 1C illustrates a cross sectional view along a minor side of the storm drain filter system taken along line A-A of FIG. 1B;

[0009] FIG. 2A illustrates another side view along a major side of a storm drain filter system and including filter, attachment and support structures for the system according to an embodiment of the present invention;

[0010] FIG. 2B is a schematic illustration of a support structure for the storm drain filter system according to an embodiment of the present invention;

[0011] FIG. 3A illustrates a side view of a filter structure for the storm drain filter system according to an embodiment of the presents invention;

[0012] FIG. 3B is a schematic top view of a support structure for the filter structure the storm drain filter system according to another embodiment of the present invention;

[0013] FIG. 4 illustrates an exploded view of various components associated with the filter system according to an embodiment of the present invention;

[0014] FIG. 5 illustrates a more detailed top view of the frame structure of FIG. 4 according to another embodiment of the present invention; and

[0015] FIGS. 6 and 7 illustrate more detailed views of the major and minor sides, respectively, of the frame structure of FIG. 4.

DETAILED DESCRIPTION OF THE INVENTION

[0016] In accordance with an aspect of the present invention, and referring generally to FIGS. 1 and 2, the storm drain filtering system generally comprises a frame 100 configured and dimensioned to be positioned underneath a storm drain grate 400 and one or more modular filter screen units that are removable from the frame for cleaning and/or replacement.

[0017] In an exemplary configuration, the frame 100 is a rectangular box-like structure having a solid bottom side and four side walls comprising two shorter minor sides (120, 130) and two longer major sides (140, 150). The two minor sides oppose each other and the two major sides oppose each other. The side walls may be grated. In a preferred embodiment of the present invention, the minor sidewalls are solid and the two major side walls are grated. The grating structure of the sidewalls may be varied in size and shape to accommodate the particular filtering needs of a given application or an installation site for the storm drain filtering system. In the attached FIG. 1A, the grate openings 160 on the major side walls are provided with different sizes to accommodate the different static pressures encountered by the frame and the filter screen 190 (FIG. 2A) at different portions along the side walls.

[0018] The top side 170 of the frame is open to let the water flow into the frame. The top edge (or lip) 172 of the frame may be configured and adapted to be supported by or hang from supporting structures that may be mounted into the wall of the catch basin of the storm drain below the storm grate. The supporting structures may be ledges or hooks. In an embodiment of the present invention illustrated in FIG. 2A, the supporting structures are ledges formed by stainless steel angle irons that are drilled and mounted into the wall of the catch basin by bolts or other suitable hardware. In another embodiment of the present invention, the supporting structures may be hooks as illustrated in FIG. 2B.

[0019] The top edge (or lip) of the frame may be provided with a flange portion 174 that may hang from the supporting structures, whether the supporting structures may be ledges or hooks. One or more handle(s) 176 having an appropriate shape may be provided along the top edge (or lip) of the frame for ease of handling the frame during installation of or removal of the storm drain filter system. In the example of

a frame illustrated in **FIG. 1A**, the handles are formed as holes provided near the top edge of the frame.

[0020] As illustrated in **FIGS. 1 and 2**, the side walls of the frame may be tapered so that the frame is wider at the top than the bottom. As illustrated in **FIG. 1 C**, which is a cross-sectional view of the frame through line A-A in **FIG. 1B**, the solid bottom side of the frame has a central ridge **180** that is raised along the longitudinal axis of the frame so that the solid bottom side is pitched downwardly from the central ridge toward the two major side walls **140, 150**. This configuration assists the water flowing into the frame to flow outwardly towards the major side walls to where the modular filter screens **190** are and out of the frame, thereby preventing unwanted collection of water in the frame.

[0021] As illustrated in **FIG. 1 C**, the solid minor side walls may be provided with one or more overflow holes **191** near the top to allow water to overflow, in the event that the filter system is filled with filtered debris and/or silt.

[0022] The major side walls of the frame may be provided with one or more side drain holes **197** along the bottom edge as shown in **FIG. 1A**.

[0023] All or most of the components of the storm drain filtering system according to the present invention may be made of a variety of materials appropriate for such application. Preferably, the components, including the frame and the modular filter screen units may be made from appropriate gauge and grade of stainless steel that provides appropriate structural strength, durability and corrosion resistance. An example of such material is 304 stainless steel.

[0024] The filter system of the present invention also includes modular filter screens **190**, one for each of the grated major side walls. The modular filter screens are mounted up against each of the two major side walls from inside the frame and filters silts and other debris from the water that flows into the top of the frame and out through the major side walls.

[0025] The modular filter screens may be a mesh or perforated sheet of some appropriate material. Preferably, the modular filter screens are made from perforated stainless steel sheets of an appropriate gauge that can withstand the structural demand of retaining silts and other debris that are being collected inside the frame and the pressure of the flowing water through the filter screens. In one embodiment of the present invention, 16 gauge grade 304 stainless steel that is perforated with $\frac{1}{8}$ " diameter holes on $\frac{3}{8}$ " centers, staggered, may be used for the filter screens. Depending on the range of the particle size of the debris to be filtered and collected by the filtering system, the diameter and the spacing of the perforation and the gauge of the stainless steel sheet may be varied accordingly. The perforation also may be any appropriate shape other than circular holes. The density of the perforations on the filter screens may be uniform throughout a given screen or, if necessary, the density of the perforations may vary across the height and width of the filter screen. For example, the perforations near the bottom end of the filter screen may have smaller and denser holes to filter silts and other debris having finer particle size. The perforations near the top end of the filter screen may have larger and less densely populated holes to filter and collect larger particle size debris.

[0026] An example of a modular filter screen unit **190** is illustrated in **FIG. 3A**. The outline shape of the modular

filter screen unit preferably matches the shape of the major side walls of the frame **100**. The modular filter screen unit may be constructed to have a frame portion supporting the perforated stainless steel sheets. The frame portion of the modular filter screen unit may be configured like a picture frame with one central opening or may be configured with one or more cross-members **194** that divide the central opening into two or more screen sections **195**. Such cross-members may provide further structural support for the filter screen to prevent the filter screen from blowing out from the water pressure or the pressure exerted by the silts and debris collecting inside the frame. The modular filter screen units are preferably provided with one or more handles **196** for ease of retrieval from the frame of the filtering system in the field.

[0027] If the cross-members of the modular filter screen units are sufficiently strong, the frame of the filter system may not need the grating structure for the major side walls. In that embodiment of the present invention, the major side walls of the frame may be just a big opening.

[0028] The modular filter screen units may be configured and dimensioned to slidably engage the frame. For example, as illustrated in **FIG. 1B**, the frame is provided with channels **200** along the side edges of the two major side walls along their inside surface. The channels preferably extend substantially the full height of the frame. Of course, the channels may also be embodied as clips or other fastening and/or guiding mechanisms. Referring to **FIG. 3B**, the side edges of the modular filter screen units **190** are configured and dimensioned to engage the channels **200** of frame **100** by sliding into the channel from the top. **FIG. 3B** is a top down view of one of the channels of the frame with a modular filter screen unit **190** slidably engaged within the channel.

[0029] To install the filtering system of the present invention, the storm drain grate is lifted up or tilted up from its normal resting position exposing the storm drain opening. If the storm drain opening does not have ledges or other suitable support structure for holding the frame of the filtering system, suitable supporting structure(s) **300** illustrated in **FIG. 2A** or **2B** are installed into the wall of the catch basin **315**. Such supporting structures include an L or U-shaped support having a first end for mounting (e.g. via bolts) to the wall and a second end mountable to the frame. The frame of the filtering system is then dropped into the storm drain opening such that the flange portion along the top edge of the frame rests on the supporting structure(s). Appropriate modular filter screen units are then installed, one on each side of the major side walls of the frame by sliding the modular filter screen units into the channels of the frame.

[0030] **FIG. 4** illustrates an exploded view of various components associated with the filter system according to another embodiment of the present invention. As shown therein, a frame structure **100'** has a T-shaped support defined by a horizontal top edge bar member **108** extending between and coupled to opposite minor side walls **120, 130**, and a single support arm **105** extending between and coupled to top edge bar member **108** and bottom **110**. Single support arm **105** is disposed on each of the major sidewalls for supporting the structure.

[0031] A removable mesh screen **187** and/or modular filter screen unit **190** is insertable into channels along the major

sidewalls of the frame. In an exemplary embodiment, a stainless steel wire mesh screen (e.g. a 200 mesh count per inch or 0.0029 inch width opening) and a 1.5 inch thick replaceable filter for collecting debris including petroleum hydrocarbons is provided. The bottom surface **110** is flat and preferably formed of solid stainless steel. A hood **210** having inwardly tapered side panels **212** may be coupled onto the top opening of frame **100'** for funneling the matter from the storm gate or drain into the structure. The structure may be formed of 304 stainless steel, including the screen and filter units.

[0032] **FIG. 5** illustrates a top view of frame structure **100'** illustrated in **FIG. 4**, while **FIGS. 6 and 7** illustrate major and minor side views of frame structure **100'**, respectively. The dimensions provided are exemplary. As shown therein, channels **205** and **210** removably accommodate filter unit **190** and mesh screen **187** to provide for debris filtering. The filter and screen may each be separately removable in a vertical fashion independent of one another. While both filter unit and screen are illustrated in the embodiment depicted, it is understood that either or both filter mechanisms may be incorporated into the frame structure.

[0033] **FIG. 6** illustrates a more detailed major side view of the frame structure **100'** having bar members **105** and **108** in a T-shaped arrangement for supporting the major sidewalls. Flange **174** enables hanging the structure as discussed with respect to **FIG. 1A**.

[0034] **FIG. 7** illustrates a more detailed minor side view of the frame structure **100'** wherein angled slots **191** provide for overflow. The structure further includes stiffener channels **199** disposed on the bottom surface as shown in **FIG. 7** for providing additional support.

[0035] The members of the public works or road maintenance crew will periodically inspect the storm drains installed with the filtering system of the present invention. If the filtering system is filled with silt or other debris, the debris may be removed by, for example, using a jet-vacuum after the storm grate is removed. If appropriate, each of the modular filter screens also may be temporarily removed for

cleaning. Because the components of the filter system, including the modular filter screen units are made of stainless steel, they are corrosion resistant and should be reused without being replaced for a long time.

What is claimed is:

1. An apparatus for removing debris from water passing through a storm drain, comprising:

a frame adapted to be positioned underneath a storm grate for receiving said water, the frame having a bottom side and major and minor sidewalls, the major sidewalls having openings therein for allowing water to pass; and

a filter removably insertable along at least a portion of the major sidewalls for filtering debris from said water.

2. The apparatus of claim 1, wherein said bottom side is solid and includes a central ridge along the longitudinal axis of the frame such that the bottom side is pitched downwardly from the central ridge toward the major sidewalls.

3. The apparatus of claim 1, further comprising channels along said major sidewalls for retaining said filter within said frame.

4. The apparatus of claim 1, wherein said frame has a rectangular shape.

5. The apparatus of claim 1, wherein said filter comprises a mesh screen.

6. The apparatus of claim 1, wherein said filter comprises a filter for collecting petroleum hydrocarbons.

7. The apparatus of claim 1, wherein said filter comprises a mesh screen in combination with a filter unit for collecting petroleum hydrocarbons.

8. The apparatus of claim 1, further comprising a support structure for coupling a portion of the frame to a wall of the storm drain.

9. The apparatus of claim 1, wherein the minor sidewalls are solid.

10. The apparatus of claim 9, wherein the major sidewalls have grated openings.

11. The apparatus of claim 10, wherein the grated openings of said major sidewalls vary in size and shape.

* * * * *