

CONTAMINANT FILTERING DEVICE

【Technical Field】

5 [1] The present invention relates to a pollutant filtration device, and more particularly, to a pollutant filtration device capable of smoothly replacing a filtration filter by cutting rainwater runoff pollutants protruding from a filtration body through the filtration filter installed in a rainwater drain.

【Background Art】

10 [2] In general, pollutants may be divided into point pollution sources with a clear emission point and non-point pollution sources with an unclear emission point. Point pollution sources may be discharged in a somewhat purified state because a separate purification device or wastewater treatment facility is installed at a discharge point.

15 [3] Meanwhile, non-point pollutants may have unclear discharge points, remain on the ground surface over a wide area, and flow into drainage systems, such as streams and rivers with rainfall, causing water pollution.

20 [4] Examples of non-point pollution sources include agricultural lands, pastures, city streets, forest lands, and suburban areas. Potential non-point pollutants mainly located on the soil surface or near the ground surface are washed by rainwater and entered into the drainage system as runoff.

 [5] Non-point pollutants are mainly pollutants that run off with surface runoff during early rainfall and refer to traffic pollutants, such as dust and waste in urban areas, fertilizers and pesticides sprayed on farmland, soil erosion,

livestock runoff, biological residues, air pollutants that fall on the ground surface.

[6] In order to prevent water pollution in streams and rivers due to pollutants contained in such initial rainfall, non-point pollutant filtration devices have been provided.

5 **[7]** Referring to FIG. 1, the related art filtration device 10 includes a filtration mesh main body 11 forming an external shape and a filtration filter 12 inserted into the filtration mesh main body 11 to collect pollutants 1.

[8] The filtration mesh main body 11 is a perforated plate strainer for suppressing expansion of pores of the filtration filter 12, while maintaining the
10 shape of the filtration filter 12.

[9] However, in the related art filtration device 10, when a large amount of pollutants 1 collected in the filtration filter 12 accumulate, the pollutants 1 cause the filtration filter 12 to inflate between meshes of the filtration mesh main body 11, which is a perforated plate strainer, and as a result, the filtration filter 12
15 protrudes (12a) between the filtration mesh main body 11 in some cases.

[10] In addition, if the filtration filter 12 protruding (12a) between the filtration mesh main body 11 is left for a long period of time, the filtration filter 12 may be broken or seeds of plants introduced together with the pollutants 1 may germinate and roots thereof may penetrate through the filtration filter 12
20 and be attached to the filtration mesh main body 11, making it difficult to replace the filtration filter 12.

[11] Accordingly, when the filtration filter 12 is separated from the filtration mesh main body 11 to replace the filtration filter 12, the filtration filter 12 may not be easily separated from the filtration mesh main body 11 or the

filtration filter 12 may be torn due to the filtration filter 12 protruding (12a) from the filtration mesh main body 11 and the pollutants 1.

[12] [Patent Document]

[13] (Patent Document 1) Korean Patent No. 10-1683365 (registered
5 on November 30, 2016)

【Disclosure】

【Technical Problem】

[14] Therefore, the present invention was derived to solve the
aforementioned problems and provides a pollutant filtration device capable of
10 smoothly replacing a filtration filter by cutting rainwater runoff pollutants
protruding from a filtration body through the filtration filter installed in a
rainwater drain.

[15] In addition, the present invention provides a pollutant filtration
device capable of securing wide space for collecting pollutants by bringing a
15 filtration filter inserted into a filtration main body into close contact with the
filtration main body.

[16] In addition, the present invention provides a pollutant filtration
device capable of blocking an inlet of a filtration filter to prevent pollutants
collected in a filtration filter from escaping to the outside.

20 [17] Other objects of the present invention will become clearer
through embodiments described below.

【Technical Solution】

[18] According to a first embodiment of the present invention, a
pollutant filtration device includes: a mesh structure filtration unit including an

opening through which foreign matter is introduced; a filtration filter inserted into the mesh structure filtration unit; and a support member inserted into the opening of the mesh structure filtration unit and supporting the filtration filter to be in close contact with inside of the mesh structure filtration unit.

5 **[19]** The support member may include an upper frame located in the opening of the mesh structure filtration unit and a plurality of side frames coupled to the upper frame at a regular interval.

[20] The support member may further include a lower frame coupled to the plurality of side frames and including a cutting member installed toward
10 the opening of the mesh structure filtration unit.

[21] The support member may further include an auxiliary upper frame installed in close contact with the upper frame, a plurality of auxiliary side frames coupled to the auxiliary upper frame at a regular interval and installed in close contact with the plurality of side frames, and an auxiliary lower frame
15 coupled to the plurality of auxiliary side frames and including an auxiliary cutting member installed toward the opening of the mesh structure filtration unit.

[22] The support member may further include a foreign matter escape prevention member coupled to the upper frame.

[23] The support member may further include a fixing member
20 extending from the upper frame and connected to the mesh structure filtration unit.

[24] The mesh structure filtration unit may include a plurality of surfaces on which a mesh is formed, and a portion or the entirety of at least one of the plurality of surfaces on which the mesh is formed may be separated from another adjacent surface.

【Advantageous Effects】

[25] The pollutant filtration device according to an embodiment of the present invention provides the following effects.

[26] The present invention has the effect of smoothly replacing a
5 filtration filter by cutting rainwater runoff pollutants protruding from a filtration body through the filtration filter installed in a rainwater drain.

[27] The present invention has the effect of securing wide space for collecting pollutants by bringing a filtration filter inserted into a filtration main body into close contact with the filtration main body.

10 [28] The present invention has the effect of blocking an inlet of a filtration filter to prevent pollutants collected in a filtration filter from escaping to the outside.

[29] The effects of the present invention are not limited to those mentioned above, and other effects not mentioned may be clearly understood by
15 those skilled in the art from the following description.

【Description of Drawings】

[30] FIG. 1 is a perspective view illustrating the related art filtration device.

[31] FIG. 2 is a perspective view illustrating a pollutant filtration
20 device according to a first embodiment of the present invention.

[32] FIG. 3 is an exploded perspective view illustrating a pollutant filtration device according to the first embodiment of the present invention.

[33] FIG. 4 is a perspective view illustrating a mesh structure filtration unit of a pollutant filtration device according to the first embodiment of

the present invention.

[34] FIG. 5 is an exploded perspective view illustrating a first example of a support member of a pollutant filtration device according to the first embodiment of the present invention.

5 **[35]** FIG. 6 is a perspective view illustrating a second example of a support member of a pollutant filtration device according to the first embodiment of the present invention.

[36] FIG. 7 is a perspective view illustrating a third example of a support member of a pollutant filtration device according to the first embodiment
10 of the present invention.

[37] FIG. 8 is an exploded perspective view illustrating a pollutant filtration device according to a second embodiment of the present invention.

[38] FIG. 9 is an exploded perspective view illustrating a first example of a support member of a pollutant filtration device according to the
15 second embodiment of the present invention.

[39] FIG. 10 is a perspective view illustrating a second example of a support member of a pollutant filtration device according to the second embodiment of the present invention.

[40] FIG. 11 is a perspective view illustrating a third example of a
20 support member of a pollutant filtration device according to the second embodiment of the present invention.

【Mode for Invention】

[41] The present invention may be variously modified and have several forms. Therefore, specific exemplary embodiments of the present invention will be illustrated in the accompanying drawings and be described in
5 detail in the present specification. However, it is to be understood that the present invention is not limited to the specific exemplary embodiments, but includes all modifications, equivalents, and substitutions included in the spirit and the scope of the present invention. When it is determined that a detailed description for any known art related to the present invention may obscure the
10 gist of the present invention, the detailed description will be omitted.

[42] Terms used in the present specification are used only in order to describe specific exemplary embodiments rather than limiting the present invention. Singular forms are intended to include plural forms unless the context clearly indicates otherwise. It will be further understood that the terms
15 "comprises" or "have" used in this specification, specify the presence of stated features, steps, operations, components, parts mentioned in this specification, or a combination thereof, but do not preclude the presence or addition of one or more other features, numerals, steps, operations, components, parts, or a combination thereof.

20 **[43]** Terms used in the specification, 'first', 'second', etc., may be used to describe various components, but the components are not to be interpreted to be limited to the terms. The terms are used only to distinguish one component from another component.

[44] Hereinafter, embodiments of the present invention will be described in detail with reference to the accompanying drawings. In describing an exemplary embodiment of the present invention with reference to the accompanying drawings, components that are the same as or correspond to each other will be denoted by the same reference numerals regardless of the reference numbers, and an overlapped description thereof will be omitted.

[45] Hereinafter, a pollutant filtration device according to embodiments of the present invention will be described in detail with reference to FIGS. 2 to 11.

[46] FIG. 2 is a perspective view illustrating a pollutant filtration device according to a first embodiment of the present invention, and FIG. 3 is an exploded perspective view illustrating the pollutant filtration device according to the first embodiment of the present invention.

[47] As shown in FIGS. 1 and 2, a pollutant filtration device 100 according to the first embodiment of the present invention may include a mesh structure filtration unit 110, a filtration filter 120, and a support member 130.

[48] The mesh structure filter unit 1 may filter rainwater runoff or running water containing foreign matter. An opening 111 through which rainwater runoff or foreign matter is introduced may be formed on an upper surface of the mesh structure filtration unit 110.

[49] The filtration filter 120 may be inserted into the mesh structure filtration unit 110, and foreign matter, such as pollutants, may be filtered out from rainwater runoff or running water containing foreign matter flowing into the opening 111.

[50] The mesh structure filtration unit 110 may be connected to a collection device (not shown) installed close to the ground. The collection device may collect rainwater runoff or running water containing foreign matter and collect the same to the opening 111 of the mesh structure filtration unit 110.

5 [51] In an embodiment, the mesh structure filtration unit 110 may be connected to the collection device by a weight detection device (not shown). The weight detection device may measure the weight of pollutants collected by the mesh structure filtration unit 110. If the weight of pollutants collected in the mesh structure filtration unit 110 exceeds a preset weight, the weight detection device
10 may generate a filter replacement signal and transmit the filter replacement signal to a monitoring server (not shown).

[52] Here, the monitoring server may manage the filtration filter 120 installed in the corresponding mesh structure filtration unit 110 according to the filter replacement signal.

15 [53] Referring to FIG. 4, the mesh structure filtration unit 110 may include a plurality of surfaces on which a mesh including a plurality of filtering holes 112 is formed. The plurality of surfaces on which the mesh is formed may be side and lower surfaces.

[54] As for the plurality of surfaces on which the mesh is formed,
20 some or all of at least of the plurality of surfaces may be separated from neighboring surfaces. That is, at least one of the plurality of surfaces on which the mesh is formed may be open in one direction.

[55] For example, a plurality of side surfaces among the plurality of surfaces on which the mesh is formed may be rotatably coupled to one lower surface with a hinge H. In addition, a plurality of side surfaces among the plurality of surfaces on which the mesh is formed may be interconnected to other adjacent surfaces through separate fastening members C1 and C2. Here, the fastening members C1 and C2 may be a locking protrusion and a locking ring that are simple to operate.

[56] The filtration filter 120 may be replaced through the opening 111 of the mesh structure filtration unit 110, but the filtration filter 120 may also be replaced through at least one open surface among the plurality of surfaces on which the mesh is formed.

[57] The filtration filter 120 may be inserted into the mesh structure filtration unit 110. The filtration filter 120 has a bag-like shape and includes micro-holes like non-woven fabric and may discharge running water in which pollutants have been filtered through the micro-holes.

[58] The filtration filter 120 may be installed between the mesh structure filtration unit 110 and the support member 130. The filtration filter 120 may be in close contact with the mesh structure filtration unit 110 by the support member 130.

[59] That is, after the filtration filter 120 is inserted into the mesh structure filtration unit 110, the support member 130 may be inserted therein and the filtration filter 120 may be in close contact with the mesh structure filtration unit 110 depending on the shape of the support member 130.

[60] The filtration opening 121 of the filtration filter 120 may be fixed to the inside of the support member 130 or may be fixed to the outside of the support member 130.

[61] Pollutants may accumulate in the filtration filter 120. Since the
 5 filtration filter 120 is formed of a material, such as non-woven fabric, the filtration filter 120 may expand due to accumulated pollutants and water pressure. In this case, the filtration filter 120 may be inflated and pushed into the filtration hole 112 of the mesh structure filtration unit 110 and may be partially broken. Pollutants may pass through the broken portion of the filtration filter 120.

10 [62] Thereafter, when the support member 130 inserted into the filtration filter 120 is removed from the mesh structure filtration unit 110, the pollutants passing through the filtration filter 120 may be cut by the support member 130.

[63] Accordingly, the filtration filter 120 may be easily separated
 15 from the mesh structure filtration unit 110.

[64] Meanwhile, in the drawing, the filtration filter 120 is shown as being formed in a roughly rectangular shape, but this is simply for illustration purposes and may be formed in a free shape, such as non-woven fabric, as described above.

20 [65] The support member 130 may be inserted into the opening 111 of the mesh structure filtration unit 110 to support the filtration filter 120 in close contact with the inside of the mesh structure filtration unit 110. Here, the support member 130 may be inserted into the filtration filter 120 inserted into the opening 111 of the mesh structure filtration unit 110.

[66] The support member 130 may include an upper frame 131 and a side frame 132.

[67] The upper frame 131 may be located in the opening 111 of the mesh structure filtration unit 110. A support opening 1311 may be formed in the upper frame 131 at a position corresponding to the opening 111 of the mesh structure filtration unit 110. A plurality of side frames 132 may be coupled to the upper frame 131.

[68] The side frame 132 may be coupled to the upper frame 131 at a regular interval. The side frame 132 may be provided in plurality. The side frame 132 may be formed in a straight shape, channel shape, etc., and the filtration filter 120 may be brought into close contact with the mesh structure filtration unit 110.

[69] As a first example, referring to FIG. 5, the support member 130 may further include an auxiliary upper frame 133, an auxiliary side frame 134, and an auxiliary lower frame 135. The auxiliary upper frame 133, the auxiliary side frame 134, and the auxiliary lower frame 135 may be located inside the support member 130.

[70] The auxiliary upper frame 133 may be installed in close contact with the upper frame 131. An auxiliary opening 1331 may be formed in the auxiliary upper frame 133 at a position corresponding to the support opening 1311 of the upper frame 131. A plurality of auxiliary side frames 134 may be coupled to the auxiliary upper frame 133.

[71] The auxiliary side frame 134 may be coupled to the auxiliary upper frame 133 at a regular interval and installed in close contact with the plurality of side frames 132. The auxiliary side frame 134 may be provided in

plurality. The auxiliary side frame 134 may be formed in a straight shape, a channel shape, etc.

[72] The auxiliary lower frame 135 may be coupled to the auxiliary side frame 134.

5 **[73]** The auxiliary lower frame 135 may be coupled to the plurality of auxiliary side frames 134. The auxiliary lower frame 135 may include an auxiliary cutting member 1351 installed toward the opening 111 of the mesh structure filtration unit 110.

[74] The auxiliary cutting member 1351 may be coupled to an upper
10 portion of the auxiliary lower frame 135 and may be formed to be sharp like a blade to cut pollutants passing through the filtration filter 120.

[75] Here, the filtration filter 120 may be installed between a frame including the upper frame 131 and the side frame 132 and a frame including the auxiliary upper frame 133, the auxiliary side frame 134, and the auxiliary lower
15 frame 135.

[76] As a second example, referring to FIG. 6, the support member 130 may further include a foreign matter escape prevention member 136.

[77] The foreign matter escape prevention member 136 may be installed in the support opening 1311 of the upper frame 131 of the support
20 member 130. The foreign matter escape prevention member 136 closes a portion of the support opening 1311 to minimize a phenomenon in which pollutants accumulated inside the filtration filter 120 escape to the support opening 1311.

[78] In an embodiment, the foreign matter escape prevention member 136 may be formed in the form of a sliding door to selectively or completely close the support opening 1311.

[79] As a third example, referring to FIG. 7, the support member 130
5 may further include a fixing member 137.

[80] The fixing member 137 may extend from the upper frame 131 and may be connected to the mesh structure filtration unit 110. The fixing member may have has a channel-shaped cross-section and may be inserted into at least one surface 113 located in the opening 111 of the mesh structure filtration unit 110.

10 [81] The fixing member 137 may prevent the filtration filter 120 and the support member 130 from shaking significantly inside the mesh structure filtration unit 110. In addition, the filtration opening 121 of the filtration filter 120 may be inserted into the fixing member 137 and then fixed to the mesh structure filtration unit 110.

15 [82] FIG. 8 is an exploded perspective view illustrating a pollutant filtration device according to a second embodiment of the present invention.

[83] As shown in FIG. 8, a pollutant filtration device 200 according to the second embodiment of the present invention may include a mesh structure filtration unit 210, a filtration filter 220, and a support member 230.

20 [84] The mesh structure filtration unit 210, the filtration filter 220, and the support member 230 according to the present embodiment are the same as the mesh structure filtration unit 110, the filtration filter 120, and the support member 130 described in the first embodiment, and thus, a detailed description will be omitted and only different components are described.

[85] The support member 230 may further include a lower frame 233.

[86] The lower frame 233 may be coupled to a plurality of side frames 232. The lower frame 233 may include a cutting member 2331 installed toward an opening 211 of the mesh structure filtration unit 210.

5 **[87]** The cutting member 2331 may be coupled to an upper portion of the lower frame 233 and is formed to be sharp like a blade to cut pollutants passing through the filtration filter 220.

[88] In an embodiment, a silicone member (not shown) may be coupled to an inner surface of the cutting member 2331 facing a support opening
10 2311. The silicone member may prevent the filtration filter 220 from being cut by the cutting member 2331.

[89] As a first example, referring to FIG. 9, the support member 230 may further include an auxiliary upper frame 234, an auxiliary side frame 235, and an auxiliary lower frame 236. The auxiliary upper frame 234, the auxiliary
15 side frame 235, and the auxiliary lower frame 236 may be inserted into the support member 230 through the lower frame 233 of the support member 230.

[90] The auxiliary upper frame 234 may be installed in close contact with the upper frame 231. An auxiliary opening 2341 may be formed in the auxiliary upper frame 234 at a position corresponding to the support opening 2311
20 of the upper frame 231. A plurality of auxiliary side frames 235 may be coupled to the auxiliary upper frame 234.

[91] The auxiliary side frame 235 may be coupled to the auxiliary upper frame 234 at a regular interval and installed in close contact with the plurality of side frames 232. The auxiliary side frame 235 may be provided in

plurality. The auxiliary side frame 235 may be formed in a straight shape, a channel shape, etc.

[92] An auxiliary lower frame 236 may be coupled to the auxiliary side frame 235. The auxiliary lower frame 236 may be coupled to the plurality of auxiliary side frames 235. The auxiliary lower frame 236 may include an auxiliary cutting member 2361 installed toward the opening 211 of the mesh structure filtration unit 210.

[93] The auxiliary cutting member 2361 may be coupled to an upper portion of the auxiliary lower frame 236 and may be formed to be sharp like a blade to cut pollutants passing through the filtration filter 220.

[94] Here, the filtration filter 220 may be installed between a frame including the upper frame 231, the side frame 232, and the lower frame 233 and a frame including the auxiliary upper frame 234, the auxiliary side frame 235, and the auxiliary lower frame 236..

[95] In the first example, the support member 230 includes two frames having the same shape, that is, one frame including the upper frame 231, the side frame 232, and the lower frame 233 and one frame including the auxiliary upper frame 234, the auxiliary side frame 235, and the auxiliary lower frame 236.

[96] As a second example, referring to FIG. 10, the support member 230 may further include a foreign material escape prevention member 237.

[97] The foreign matter escape prevention member 237 may be installed in the support opening 2311 of the upper frame 231 of the support member 230. The foreign matter escape prevention member 237 may close a portion of the support opening 2311 to minimize a phenomenon in which
5 pollutants accumulated inside the filtration filter 220 escape to the support opening 2311.

[98] As a third example, referring to FIG. 11, the support member 230 may further include a fixing member 238.

[99] The fixing member 238 may extend from the upper frame 231
10 and may be connected to the mesh structure filtration unit 210. The fixing member 238 may have a channel-shaped cross-section and may be inserted into at least one surface located in the opening 211 of the mesh structure filtration unit 210.

[100] Although an embodiment of the present invention has been disclosed above, it may be understood by those skilled in the art that the present
15 invention may be variously modified and altered without departing from the scope and spirit of the present invention described in the following claims.

【CLAIMS】

1. A pollutant filtration device comprising:
 - a mesh structure filtration unit including an opening through which
5 foreign matter is introduced;
 - a filtration filter inserted into the mesh structure filtration unit; and
 - a support member inserted into the opening of the mesh structure
filtration unit and supporting the filtration filter to be in close contact with inside
of the mesh structure filtration unit.
- 10 2. The pollutant filtration device of claim 1, wherein the support member
includes an upper frame located in the opening of the mesh structure filtration unit
and a plurality of side frames coupled to the upper frame at a regular interval.
- 15 3. The pollutant filtration device of claim 1, wherein the support member
further includes a lower frame coupled to the plurality of side frames and
including a cutting member installed toward the opening of the mesh structure
filtration unit.
- 20 4. The pollutant filtration device of one of claims 2 or 3, wherein the
support member further includes an auxiliary upper frame installed in close
contact with the upper frame, a plurality of auxiliary side frames coupled to the
auxiliary upper frame at a regular interval and installed in close contact with the
plurality of side frames, and an auxiliary lower frame coupled to the plurality of
auxiliary side frames and including an auxiliary cutting member installed toward

the opening of the mesh structure filtration unit.

5 5. The pollutant filtration device of one of claims 2 or 3, wherein the
support member further includes a foreign matter escape prevention member
coupled to the upper frame.

10 6. The pollutant filtration device of one of claims 2 or 3, wherein the
support member further includes a fixing member extending from the upper frame
and connected to the mesh structure filtration unit.

15 7. The pollutant filtration device of claim 1, wherein the mesh structure
filtration unit includes a plurality of surfaces on which a mesh is formed, and a
portion or the entirety of at least one of the plurality of surfaces on which the mesh
is formed is separated from another adjacent surface.