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(54) **Title:** A STRUCTURE FOR A DRAIN SEGMENT OF A STORM DRAIN SYSTEM

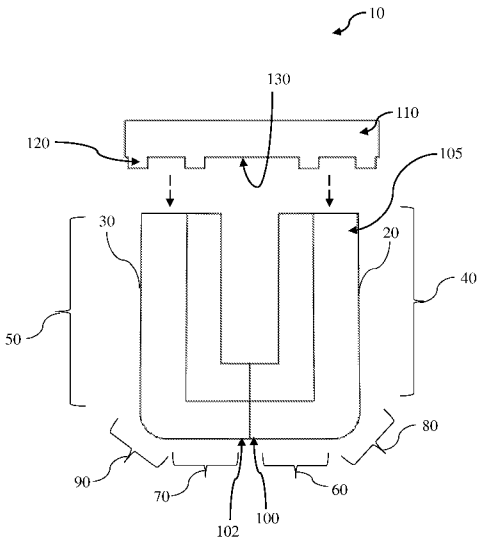

FIG. 1

(57) **Abstract:** A structure for a drain segment of a storm drain system is disclosed. The structure includes at least two L-shaped segment blocks (20, 30). Each of the at least two L-shaped segment blocks (20, 30) includes a corresponding wall portion, a corresponding floor portion, and a corresponding corner portion. The corresponding wall portion is attached to the corresponding floor portion at the corresponding corner portion, wherein the corresponding corner portion is curved outwardly. The corresponding floor portion of each of the at least two L-shaped segment blocks (20, 30) are adapted to touch each other at a distal floor-edge (100, 102) of the corresponding floor portion, for obtaining a U-shaped segment (105). The distal floor-edge (100, 102) of the corresponding floor portion is located distally from the corresponding corner portion. The structure also includes a drain cover (110) adapted to be positioned above the U-shaped segment (105) for covering the U-shaped segment (105), thereby obtaining the drain segment of the storm drain system.

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A STRUCTURE FOR A DRAIN SEGMENT OF A STORM DRAIN SYSTEM

EARLIEST PRIORITY DATE

This Application claims priority from a Complete patent application filed in India having Patent Application No. 202241034228, filed on June 15, 2022, and titled A STRUCTURE FOR A DRAIN SEGMENT OF A STORM DRAIN SYSTEM.

FIELD OF INVENTION

Embodiments of a present disclosure relate to a stormwater drainage system, and more particularly to a structure for a drain segment of a storm drain system.

BACKGROUND

A storm drain system refers to a network of structures, channels, and underground pipes that carry stormwater (rainwater) to ponds, lakes, streams, and rivers. Storm drains are essential for maintaining the appearance of landscaping, keeping a basement dry, and preventing water damage to the foundation of the houses. Storm drains are built to prevent flooding on the road, in yards, and in the vicinity of homes and businesses. Rainwater and melted snow and ice are diverted into surrounding bodies of water.

Conventionally, the storm drains are constructed on-site, and if any repair is required for the storm drains, then road digging may be needed, thereby making the repairing process unsafe, complicated, time-consuming, and expensive. Further, if there are any changes in the road width, then existing storm drains have to be destroyed or covered completely, thereby adding to the re-construction cost of the storm drains and re-construction time.

Also, sewage manholes on roads are causing risky protrusions. Further, in a case of sealed drains, cleaning is difficult and future road over-laying will cover up drain inlets on the sides of the built up drain. Moreover, other disadvantages associated with the storm drains designed or constructed in a conventional manner may be inadequate volume and high clogging risk, repair and maintenance unfriendly, the segmental repair is infeasible, built in-situ, nonstandard, uncertain, and varying quality standards.

Moreover, in the existing design, the storm drains are also built at a higher level than a road level. This causes several design and layout deficiencies such as the storm drains have to step down at intersections to enable traffic from crossroads to merge into main roads. Further, drain inlets are small holes at periodic intervals in a side of the storm drains above the road which let in the garbage into the corresponding storm drains or get clogged with the garbage preventing free water inflow into the storm drains. Additionally, the drain inlets are insufficient to capture the water run-off from heavy rains leading to water accumulation on the roads. The storm drains that have the existing design are conjoined to the roads and any substantive repairs to the storm drains lead to collateral damage to the roads or necessitate road digging. Hence, there is a need for an improved structure for a drain segment of a storm drain system which addresses the aforementioned issues.

BRIEF DESCRIPTION

In accordance with one embodiment of the disclosure, a structure for a drain segment of a storm drain system is provided. The structure includes at least two L-shaped segment blocks. Each of the at least two L-shaped segment blocks includes a corresponding wall portion, a corresponding floor portion, and a corresponding corner portion. The corresponding wall portion is attached to the corresponding floor portion at the corresponding corner portion, wherein the corresponding corner portion is curved outwardly. The corresponding floor portion of each of the at least two L-shaped segment blocks are adapted to touch each other at a distal floor-edge of the corresponding floor portion, for obtaining a U-shaped segment. The distal floor-edge of the corresponding floor portion is located distally from the corresponding corner portion. The structure also includes a drain cover adapted to be positioned above the U-shaped segment for covering the U-shaped segment, thereby obtaining the drain segment of the storm drain system

In accordance with another embodiment, a storm drain system is provided. The storm drain system includes an assembly of a set of drain segments. The assembly includes a first set of drain segments. The first set of drain segments includes at least two first L-shaped segment blocks. Each of the at least two first L-shaped segment blocks includes a corresponding first wall portion, a corresponding first floor portion, and a corresponding first corner portion. The corresponding first wall portion is attached to

the corresponding first floor portion at the corresponding first corner portion. The corresponding first corner portion is curved outwardly. The corresponding first wall portion includes a first indentation on a wall-inner surface of the corresponding first wall portion, at a set of first parallel wall-edges of the corresponding first wall portion. The corresponding first floor portion of each of the at least two first L-shaped segment blocks are adapted to touch each other at a first distal floor-edge of the corresponding first floor portion, for obtaining a first U-shaped segment. The first distal floor-edge of the corresponding floor portion is located distally from the corresponding first corner portion. The corresponding first floor portion includes a second indentation on a floor-inner surface of the corresponding first floor portion, at a set of first parallel floor-edges of the corresponding first floor portion. The second indentation includes a first projection. The first set of drain segments also includes a first drain cover adapted to be positioned on top of the first U-shaped segment for covering the first U-shaped segment, thereby obtaining the first set of drain segments. The assembly also includes a second set of drain segments. The second set of drain segments includes at least two second L-shaped segment blocks. Each of the at least two second L-shaped segment blocks includes a corresponding second wall portion, a corresponding second floor portion, and a corresponding second corner portion. The corresponding second wall portion is attached to the corresponding second floor portion at the corresponding second corner portion. The corresponding second corner portion is curved outwardly. The corresponding second wall portion includes a third indentation on a wall-outer surface of the corresponding second wall portion, at a set of second parallel wall-edges of the corresponding second wall portion. The corresponding second floor portion of each of the at least two second L-shaped segment blocks are adapted to touch each other at a second distal floor-edge of the corresponding second floor portion, for obtaining a second U-shaped segment. The second distal floor-edge of the corresponding second floor portion is located distally from the corresponding second corner portion. The corresponding second floor portion includes a first walled indentation on a floor-outer surface of the corresponding second floor portion, at a set of second parallel floor-edges of the corresponding second floor portion. The second set of drain segments also includes a second drain cover adapted to be positioned on top of the second U-shaped segment for covering the second U-shaped segment, thereby obtaining the second set of drain segments. The first set of the drain segments and the second set of the drain segments are arranged alternately, by positioning the

second set of the drain segments above the first set of the drain segments. The first set of the drain segments are interlocked with the second set of the drain segments, when the third indentation joins the first indentation and when the first walled indentation receives the first projection, upon positioning, thereby obtaining the assembly of the set of drain segments for obtaining the storm drain system.

To further clarify the advantages and features of the present disclosure, a more particular description of the disclosure will follow by reference to specific embodiments thereof, which are illustrated in the appended figures. It is to be appreciated that these figures depict only typical embodiments of the disclosure and are therefore not to be considered limiting in scope. The disclosure will be described and explained with additional specificity and detail with the appended figures.

BRIEF DESCRIPTION OF THE DRAWINGS

The disclosure will be described and explained with additional specificity and detail with the accompanying figures in which:

FIG. 1 is a schematic representation of a front view of a structure for a drain segment of a storm drain system in accordance with an embodiment of the present disclosure;

FIG. 2 is a schematic representation of a detailed view of the storm drain system in accordance with an embodiment of the present disclosure;

FIG. 3 is a schematic representation of an exemplary embodiment of an isometric view of the structure of FIG. 1 used in the storm drain system of FIG. 2 as the first set of drain segments in accordance with an embodiment of the present disclosure;

FIG. 4 is a schematic representation of an exemplary embodiment of an isometric view of the structure of FIG. 1 used in the storm drain system of FIG. 2 as the second set of drain segments in accordance with another embodiment of the present disclosure;

FIG. 5 is a schematic representation of an exemplary embodiment of one or more types of the drain cover of FIG. 1 arranged one after the other on top of the storm drain system of FIG. 2 in accordance with an embodiment of the present disclosure;

FIG. 6 is a schematic representation of a specific embodiment, of a cross-section view of a space between one or more roads and the assembly of FIG. 1 on a roadside in accordance with an embodiment of the present disclosure;

FIG. 7 is a schematic representation of another specific embodiment of a cross-section view of a space between one or more roads and the assembly of FIG. 1 on a roadside with a traffic crossover segment in accordance with an embodiment of the present disclosure; and

FIG. 8 is a schematic representation of an embodiment of a cross-section view of a crossover frame used in the storm drain system of FIG. 2 in accordance with an embodiment of the present disclosure.

Further, those skilled in the art will appreciate that elements in the figures are illustrated for simplicity and may not have necessarily been drawn to scale. Furthermore, in terms of the construction of the device, one or more components of the device may have been represented in the figures by conventional symbols, and the figures may show only those specific details that are pertinent to understanding the embodiments of the present disclosure so as not to obscure the figures with details that will be readily apparent to those skilled in the art having the benefit of the description herein.

DETAILED DESCRIPTION

For the purpose of promoting an understanding of the principles of the disclosure, reference will now be made to the embodiment illustrated in the figures and specific language will be used to describe them. It will nevertheless be understood that no limitation of the scope of the disclosure is thereby intended. Such alterations and further modifications in the illustrated system, and such further applications of the principles of the disclosure as would normally occur to those skilled in the art are to be construed as being within the scope of the present disclosure.

The terms "comprises", "comprising", or any other variations thereof, are intended to cover a non-exclusive inclusion, such that a process or method that comprises a list of steps does not include only those steps but may include other steps not expressly listed or inherent to such a process or method. Similarly, one or more devices or sub-systems

or elements or structures or components preceded by "comprises... a" does not, without more constraints, preclude the existence of other devices, sub-systems, elements, structures, components, additional devices, additional sub-systems, additional elements, additional structures or additional components. Appearances of the phrase "in an embodiment", "in another embodiment" and similar language throughout this specification may, but not necessarily do, all refer to the same embodiment.

Unless otherwise defined, all technical and scientific terms used herein have the same meaning as commonly understood by those skilled in the art to which this disclosure belongs. The system, methods, and examples provided herein are only illustrative and not intended to be limiting.

In the following specification and the claims, reference will be made to a number of terms, which shall be defined to have the following meanings. The singular forms “a”, “an”, and “the” include plural references unless the context clearly dictates otherwise.

Embodiments of the present disclosure relate to a structure for a drain segment of a storm drain system. As used herein, the term “storm drain system” refers to a network of structures, channels, and underground pipes that carry stormwater (rainwater) to ponds, lakes, streams, and rivers. The drain segment is one such structure that is a part of the storm drain system. Further, the structure described hereafter in FIG. 1 is the structure for the drain segment of the storm drain system.

FIG. 1 is a schematic representation of a front view of a structure (10) for a drain segment of a storm drain system in accordance with an embodiment of the present disclosure. The structure (10) includes at least two L-shaped segment blocks (20, 30). Each of the at least two L-shaped segment blocks (20, 30) includes a corresponding wall portion (40, 50), a corresponding floor portion (60, 70), and a corresponding corner portion (80, 90). The corresponding wall portion (40, 50) is attached to the corresponding floor portion (60, 70) at the corresponding corner portion (80, 90). The corresponding corner portion (80, 90) is curved outwardly.

In one exemplary embodiment, the at least two L-shaped segment blocks (20, 30) may include at least two L-shaped precast concrete segment blocks. Basically, the at least two L-shaped segment blocks (20, 30) may be manufactured at one or more manufacturing sites and then maybe assembled at one or more assembly sites for

obtaining the storm drain system. In one embodiment, the one or more assembly sites may include roadsides, footpaths, adjacent to the footpaths, or the like.

Further, in an embodiment, the wall portion (40, 50) may include a plurality of first openings (as shown in FIG. 2). The plurality of first openings may be adapted to assist in lifting and positioning the drain segment during assembling of the drain segment for obtaining the storm drain system.

Furthermore, in an embodiment, the corresponding wall portion (40, 50) may be tilted outwardly by making a predefined angle with the corresponding floor portion (60, 70). In one exemplary embodiment, the predefined angle may include at most about 5 degrees. Moreover, the corresponding corner portion (80, 90) being curved outwardly, and the corresponding wall portion (40, 50) tilted outwardly, may assist in making the assembling and removal of the drain segment smooth.

In one embodiment, the corresponding wall portion (40, 50) may have one or more first predefined dimensions. The one or more first predefined dimensions may include a first predefined length of about 48 inches, a first predefined width of about 48 inches, a first predefined thickness of about 4 inches, and the like. Further, in an embodiment, the corresponding floor portion (60, 70) may have one or more second predefined dimensions. The one or more second predefined dimensions may include a second predefined length of about 36 inches, a second predefined width of about 48 inches, a second predefined thickness of about 4 inches, and the like.

The corresponding floor portion (60, 70) of each of the at least two L-shaped segment blocks (20, 30) are adapted to touch each other at a distal floor-edge (100, 102) of the corresponding floor portion (60, 70), for obtaining a U-shaped segment (105). The distal floor-edge (100, 102) of the corresponding floor portion (60, 70) is located distally from the corresponding corner portion (80, 90).

The structure (10) also includes a drain cover (110) adapted to be positioned above the U-shaped segment (105) for covering the U-shaped segment (105), thereby obtaining the drain segment of the storm drain system. In one embodiment, the drain cover (110) may include at least one of a precast concrete drain cover, a grill-type metal drain cover, a flush with a surface to prevent hindrance to one or more pedestrians, and one or more cyclists, and the like. Therefore, in an embodiment, the drain cover (110) may

also be manufactured along with the at least two L-shaped segment blocks (20, 30), and then assembled on top of the corresponding at least two L-shaped segment blocks (20, 30) at the one or more assembly sites.

In an embodiment, the drain cover (110) may have one or more third predefined dimensions. The one or more third predefined dimensions may include a third predefined length of about 36 inches to about 78 inches, a third predefined width of about 40 inches to about 48 inches, a third predefined thickness of about 4 inches, and the like.

In one exemplary embodiment, the drain cover (110) may include a plurality of second openings (as shown in FIG. 5). The plurality of second openings may be adapted to allow stormwater to drain into the drain segment when the stormwater flows over the drain segment. The drain segment may also include a plurality of paired projections (120) positioned on a cover-inner surface (130) of the drain cover (110). The plurality of paired projections (120) may be adapted to lock the drain cover (110) to the U-shaped segment (105), when the drain cover (110) is positioned above the U-shaped segment (105).

In an embodiment, the plurality of paired projections (120) may have one or more fourth predefined dimensions. The one or more fourth predefined dimensions may include about a fourth predefined length of about 6 inches, a fourth predefined width of about 2 inches, a fourth predefined height of about 1 inch, and the like. Further, in an embodiment, the one or more third predefined dimensions may vary based on a variation in at least one of the one or more first predefined dimensions and the one or more second predefined dimensions.

FIG. 2 is a schematic representation of a detailed view of the storm drain system (140) in accordance with an embodiment of the present disclosure. The storm drain system (140) includes an assembly of a set of drain segments. In an embodiment, the corresponding assembly may be located at the one or more assembly sites. The assembly includes a first set of drain segments (150). Basically, in an embodiment, the set of drain segments may include the first set of drain segments (150).

The first set of drain segments (150) includes at least two first L-shaped segment blocks (160, 170). Each of the at least two first L-shaped segment blocks (160, 170)

includes a corresponding first wall portion (180, 182), a corresponding first floor portion (190, 192), and a corresponding first corner portion (200, 202). The corresponding first wall portion (180, 182) is attached to the corresponding first floor portion (190, 192) at the corresponding first corner portion (200, 202).

In one embodiment, the corresponding first wall portion (180, 182) may include the plurality of first openings (210). The corresponding first wall portion (180, 182) includes a first indentation (220) on a wall-inner surface of the corresponding first wall portion (180, 182), at a set of first parallel wall-edges of the corresponding first wall portion (180, 182).

Further, in an embodiment, the first indentation (220) may have one or more fifth predefined dimensions. The one or more fifth predefined dimensions may include a fifth predefined width of about 6 inches, a first predefined depth of about 2 inches, and the like.

The corresponding first floor portion (190, 192) of each of the at least two first L-shaped segment blocks (160, 170) are adapted to touch each other at a first distal floor-edge (240, 250) of the corresponding first floor portion (190, 192), for obtaining a first U-shaped segment.

The corresponding first floor portion (190, 192) includes a second indentation (260) on a floor-inner surface of the corresponding first floor portion (190, 192), at a set of first parallel floor-edges of the corresponding first floor portion (190, 192). The second indentation (260) includes a first projection (280). In one embodiment, the second indentation (260) may have one or more sixth predefined dimensions. The one or more sixth predefined dimensions may include a sixth predefined width of about 4 inches, a second predefined depth of about 2 inches, and the like. Similarly, in an embodiment, the first projection (280) may have one or more seventh predefined dimensions. The one or more seventh predefined dimensions may include a seventh predefined width of about 1 inch, a seventh predefined length of about 30 inches, and the like.

The assembly also includes a second set of drain segments (290). Moreover, in an embodiment, the set of drain segments may include the second set of drain segments (290). The second set of drain segments (290) includes at least two second L-shaped segment blocks (300, 310). Each of the at least two second L-shaped segment blocks

(300, 310) includes a corresponding second wall portion (320, 322), a corresponding second floor portion (330, 332), and a corresponding second corner portion (340, 342). The corresponding second wall portion (320, 322) is attached to the corresponding second floor portion (330, 332) at the corresponding second corner portion (340, 342).

The corresponding second wall portion (320, 322) includes a third indentation (as shown in FIG. 4) on a wall-outer surface of the corresponding second wall portion (320, 322), at a set of second parallel wall-edges of the corresponding second wall portion (320, 322). In one embodiment, the third indentation may have the one or more fifth predefined dimensions.

The corresponding second floor portion (330, 332) of each of the at least two second L-shaped segment blocks (300, 310) are adapted to touch each other at a second distal floor-edge (350, 355) of the corresponding second floor portion (330, 332), for obtaining a second U-shaped segment.

The corresponding second floor portion (330, 332) includes a first walled indentation (not shown in FIG. 2) on a floor-outer surface of the corresponding second floor portion (330, 332), at a set of second parallel floor-edges of the corresponding second floor portion (330, 332). In one embodiment, the first walled indentation may have one or more eighth predefined dimensions. The one or more eighth predefined dimensions may include an eighth predefined width of about 1.5 inches, an eighth predefined length of about 32 inches.

The first set of drain segments (150) and the second set of drain segments (290) are arranged alternately, by positioning the second set of drain segments (290) above the first set of drain segments (150). The first set of drain segments (150) is interlocked with the second set of drain segments (290), when the third indentation joins the first indentation (220) and when the first walled indentation receives the first projection (280), upon positioning, thereby obtaining the assembly of the set of drain segments for obtaining the storm drain system (140).

In one exemplary embodiment, the first set of drain segments (150) may include a discharge drain segment (370) including the first floor portion (190, 192), wherein the first floor portion (190, 192) may include a plurality of third openings (380). In another exemplary embodiment, the second set of drain segments (290) may include the

discharge drain segment (370) including the second floor portion (330, 332), wherein the second floor portion (330, 332) may include the plurality of third openings (380). The discharge drain segment (370) may be positioned above a recharge well (built beneath) for the discharge drain segment (370) to discharge stormwater to the corresponding recharge well, via the plurality of third openings (380).

In addition, in an embodiment, the corresponding first floor portion (190, 192) may include a second walled indentation (not shown in FIG. 2) on the floor-inner surface of the corresponding first floor portion (190, 192), at the set of the first parallel floor-edges of the corresponding first floor portion (190, 192). In one embodiment, the second walled indentation may have the one or more eighth predefined dimensions.

The corresponding second floor portion (330, 332) may include a fourth indentation (not shown in FIG. 2) on the floor-outer surface of the corresponding second floor portion (330, 332), at the set of the second parallel floor-edges of the corresponding second floor portion (330, 332). The fourth indentation may include a second projection. In one embodiment, the fourth indentation may have the one or more sixth predefined dimensions. Similarly, in an embodiment, the second projection may have the one or more seventh predefined dimensions.

The first set of drain segments (150) are interlocked with the second set of drain segments (290), when the third indentation joins the first indentation (220) and when the second walled indentation receives the second projection, upon positioning, thereby obtaining the assembly of the set of drain segments for obtaining the storm drain system (140).

FIG. 3 is a schematic representation of an exemplary embodiment of an isometric view of the structure (10) of FIG. 1 used in the storm drain system (140) of FIG. 2 as the first set of drain segments (150) in accordance with an embodiment of the present disclosure. The storm drain system (140) includes the at least two first L-shaped segment blocks (160, 170). Also, the corresponding first wall portion (180, 182) is attached to the corresponding first floor portion (190, 192) at the corresponding first corner portion (200, 202). The corresponding first corner portion (200, 202) is curved outwardly.

In an embodiment, as the corresponding first wall portion (180, 182) includes the first indentation (220) on the wall-inner surface of the corresponding first wall portion (180, 182), the first indentation (220) may be L-shaped.

The corresponding first floor portion (190, 192) of each of the at least two first L-shaped segment blocks (160, 170) are adapted to touch each other at the first distal floor-edge (240, 250) of the corresponding first floor portion (190, 192), for obtaining the first U-shaped segment (385). The first distal floor-edge (240, 250) of the corresponding floor portion (60, 70) is located distally from the corresponding first corner portion (200, 202).

In an embodiment, as the corresponding first floor portion (190, 192) includes the second indentation (260) on the floor-inner surface of the corresponding first floor portion (190, 192), the second indentation (260) may also be L-shaped. Further, in an embodiment, the first projection (280) on the second indentation (260) may have a first predefined shape. In one exemplary embodiment, the first predefined shape may include a cube shape, a cuboid shape, or the like.

The storm drain system (140) also includes a first drain cover (390) adapted to be positioned on top of the first U-shaped segment (385) for covering the first U-shaped segment (385), thereby obtaining the storm drain system (140).

FIG. 4 is a schematic representation of an exemplary embodiment of an isometric view of the structure (10) of FIG. 1 used in the storm drain system (140) of FIG. 2 as the second set of drain segments (290) in accordance with another embodiment of the present disclosure. The second set of drain segments (290) includes the at least two second L-shaped segment blocks (300, 310). Also, the corresponding second wall portion (320, 322) is attached to the corresponding second floor portion (330, 332) at the corresponding second corner portion (340, 342). The corresponding second corner portion (340, 342) is curved outwardly.

In an embodiment, as the corresponding second wall portion (320, 322) includes the third indentation (392) on the wall-outer surface of the corresponding second wall portion (320, 322), the third indentation (392) may be L-shaped.

The corresponding second floor portion (330, 332) of each of the at least two second L-shaped segment blocks (300, 310) are adapted to touch each other at the second distal floor-edge (350, 355) of the corresponding second floor portion (330, 332), for obtaining the second U-shaped segment (395). The second distal floor-edge (350, 355) of the corresponding second floor portion (330, 332) is located distally from the corresponding second corner portion (340, 342).

In an embodiment, as the corresponding second floor portion (330, 332) includes the first walled indentation on the floor-outer surface of the corresponding second floor portion (330, 332), the first walled indentation may be U-shaped. Further, in an embodiment, the first walled indentation may have the first predefined shape.

The second set of drain segments (290) also includes a second drain cover (400) adapted to be positioned on top of the second U-shaped segment (395) for covering the second U-shaped segment (395), thereby obtaining the second set of drain segments (290).

Furthermore, the first set of drain segments (150) are interlocked with the second set of drain segments (290), when the third indentation (392) joins the first indentation (220) and when the first walled indentation receives the first projection (280), upon positioning, thereby obtaining the assembly of the set of drain segments for obtaining the storm drain system (140).

FIG. 5 is a schematic representation of an exemplary embodiment (405) of one or more types of the drain cover (110) of FIG. 1 arranged one after the other on top of the storm drain system (140) of FIG. 2 in accordance with an embodiment of the present disclosure. In one embodiment, the one or more types may include the precast concrete drain cover (410), the grill-type metal drain cover (420), or the like. Also, in an embodiment, the drain cover (110) may be the first drain cover (390) or the second drain cover (400). In an embodiment, the first drain cover (390) may have a fifth indentation on a cover-top surface (430) of the first drain cover (390), at a set of first parallel cover-edges of the corresponding first drain cover (390). Further, in an embodiment, the second drain cover (400) may have a sixth indentation on a cover-bottom surface of the second drain cover (400), at a set of second parallel cover-edges of the corresponding second drain cover (400).

Furthermore, in an embodiment, the first drain cover (390) is interlocked with the second drain cover (400), the fifth indentation joins the sixth indentation, upon positioning the first drain cover (390) and the second drain cover (400) one after the other on top of the storm drain system (140).

Moreover, in an embodiment, the drain cover (110) may be the grill-type metal drain cover (420) at every about 100 meters of the storm drain system (140), for enabling easy access to repair points and for preventing any kind of gas build up inside of the storm drain system (140).

In addition, in an embodiment, the grill-type metal drain cover (420) may have a gravity-fall-back design to ensure that the grill-type metal drain cover (420) remains in a closed position unless held open.

In one exemplary embodiment, the drain segment or the set of drain segments may be provided with one or more sensors such as a water level sensor, a gas sensor, a smoke sensor, or the like. Also, in an embodiment, the drain segment of the set of drain segments may be provided with one or more alarms to alarm a user about one or more conditions associated with the drain segment or the set of drain segments. In one embodiment, the user may be a drain repairing person, an authorized person to monitor working conditions of the storm drain segment, or the like. Further, in an embodiment, the one or more conditions may include detecting a breakage in one or more structures under the storm drain system (140), a gas detection, a smoke detection, water overflow detection, or the like.

Furthermore, in an embodiment, the drain segment having the drain cover (110) as the grill-type metal drain cover (420), may also have a ladder installed below, for providing access to the user to go inside of the drain segment for repair or cleaning purposes.

Moreover, in an embodiment, the drain segment having the drain cover (110) as the grill-type metal drain cover (420) may be labeled, for enabling a quick identification for repairs. In one labeling may be done using at least one of a numbering system, pin codes, alphanumeric characters, and the like.

FIG. 6 is a schematic representation of a specific embodiment (440) of a cross-section view of a space (445) between one or more roads and the assembly of FIG. 1 on a roadside in accordance with an embodiment of the present disclosure. In an embodiment, the assembly of the set of drain segments may be adapted to be placed parallelly to the one or more roads by maintaining a predefined distance between the one or more roads and the corresponding assembly. The predefined distance may include about 24 inches.

Further, in an embodiment, the space (445) between the one or more roads and the assembly may be filled with coarse aggregate (450) for about 20 inches in width of the 24 inches of the predefined distance. Then, in an embodiment, a remaining 4-inch space may receive a precast curb edging (460). Therefore, a thickness of the precast curb edging (460) may be about 4 inches. Basically, the coarse aggregate (450) may be touching an edge (470) of the storm drain segment (140), and the precast curb edging (460) may be touching a road base (480) of the one or more roads.

In one exemplary embodiment, the coarse aggregate (450) may assist in filtering garbage into an inlet of the storm drain system (140). Further, in an embodiment, the precast curb edging (460) may be protruded above a road level of the one or more roads. Furthermore, in an embodiment, the precast curb edging (460) may have one or more seventh indentations (490) on either side of the precast curb edging (460). In one embodiment, the one or more seventh indentations (490) may have a depth and length of about 2 inches, and a width of about 1 inch. Further, the one or more seventh indentations (490) may be provided to the precast curb edging (460) for lifting and positioning the corresponding precast curb edging (460).

Moreover, in an embodiment, prior to filling the coarse aggregate (450), a concrete slab (500) may be positioned in the corresponding space between the one or more roads and the assembly. The concrete slab (500) may be having a length of about 20 inches. Basically, the concrete slab (500) may be placed on top of plain cement concrete (PCC) layer (510). Moreover, in an embodiment, the PCC layer (510) may be placed on top of soil and aggregate rubble (520).

Further, during the removal of the assembly of the set of drain segments, the coarse aggregate (450) along with the concrete slab (500) may be removed at first, and then the assembly may be removed.

FIG. 7 is a schematic representation of another specific embodiment (522) of a cross-section view of the space (445) between the one or more roads and the assembly of FIG. 1 on a roadside with a traffic crossover segment (524) in accordance with an embodiment of the present disclosure. In one exemplary embodiment, one or more locations where curbside access from the one or more roads to one or more establishments may be required, the traffic crossover segment (524) may be used. In one embodiment, the traffic crossover segment (524) may be an inverted concrete U-shaped segment covering the space (445) of 24 inches between the one or more roads and the assembly over the concrete slab (500) to enable smooth access to the one or more establishments. In an embodiment, the one or more establishments may include one or more shops, one or more houses, one or more outlets, or the like.

In one embodiment, the traffic crossover segment (524) may facilitate the movement of traffic or the one or more pedestrians over the space (445) between the one or more roads and the assembly. Also, in an embodiment, the traffic crossover segment (524) may have one or more ninth predefined dimensions The one or more ninth predefined dimensions may include a ninth predefined height of about 24 inches, a ninth predefined width of about 19 inches, a ninth predefined thickness of about 4 inches, and the like.

FIG. 8 is a schematic representation of an embodiment of a cross-section view of a crossover frame (530) used in the storm drain system (140) of FIG. 2 in accordance with an embodiment of the present disclosure. Basically, in an embodiment, the storm drain system (140) may include the crossover frame (530). The crossover frame (530) may be adapted to be positioned in between the assembly of the set of drain segments based on a predefined condition. The predefined condition may include positioning the crossover frame (530) when the assembly of the set of drain segments crosses over a sewage drain assembly (540).

In one embodiment, the crossover frame (530) may also be U-shaped. Further, in an embodiment, the crossover frame (530) may have a height of about 48 inches, a width

of about 72 inches, and a length of about 36 inches. Moreover, in an embodiment, the crossover frame (530) may be provided with at least two legs (550) on a frame bottom surface (560) of the crossover frame (530) to interlock the crossover frame (530) with a top surface (570) of the sewage drain assembly (540), when the crossover frame (530) may be positioned on the corresponding sewage drain assembly (540). Further, in an embodiment, each of the at least two legs (550) may have a height of about 1 inch, a width of about 4 inches, and a length of about 2 inches.

Various embodiments of the present disclosure enable reusability of the structure for the drain segment in case of road widening, as the structure is a high-strength precast segment having a life span of about more than 40 years, which are movable to expanded locations. The structure is suitable for all types of roads such as ideal, standard, and basic road types, thereby making the structure more efficient and more feasible to use.

Further, usage of the structure prevents road digging for utility repairs and thereby minimizing the repair requirement of roads and enabling a safe and easier repair process. Furthermore, as the storm drain system is modular and uses an interlocking mechanism, ensures high reusability, easy maintenance, and easy repairs and replacements.

Moreover, the storm drain system is provided with the grill-type metal drain cover are intervals to ensure easy access to repairs and to prevent the trapping of gas. Also, as the structure is a precast structure, and can be reused, makes the process of constructing the storm drain segment is cost-effective, time-saving, and user friendly. Further, the interlocking of the set of drain segments with each other prevents individual segment movement due to earth displacement.

Subsequently, the set of drain segments when assembled together constitute a continuous drain pattern and can easily and quickly be assembled at the site. Further, time-consuming civil work in an operating traffic condition is minimized. Furthermore, individual segments can be repaired and replaced without damaging other segments by following the segment removal sequence.

Also, the structure is highly durable and sustainable as the structure is made from high-performance concrete and would be reusable in case of road expansion. Moreover, the

structure may assist in water conservation, because the storm drain system stretches without a natural exit to the water reservoirs, and can have built-in recharge wells at the lowest points.

While specific language has been used to describe the disclosure, any limitations arising on account of the same are not intended. As would be apparent to a person skilled in the art, various working modifications may be made to the method in order to implement the inventive concept as taught herein.

The figures and the foregoing description give examples of embodiments. Those skilled in the art will appreciate that one or more of the described elements may well be combined into a single functional element. Alternatively, certain elements may be split into multiple functional elements. Elements from one embodiment may be added to another embodiment. For example, order of processes described herein may be changed and are not limited to the manner described herein. Moreover, the actions of any flow diagram need not be implemented in the order shown; nor do all of the acts need to be necessarily performed. Also, those acts that are not dependent on other acts may be performed in parallel with the other acts. The scope of embodiments is by no means limited by these specific examples.

I CLAIM:

1. A structure (10) for a drain segment of a storm drain system (140) comprising:

at least two L-shaped segment blocks (20, 30), wherein each of the at least two L-shaped segment blocks (20, 30) comprises:

a corresponding wall portion (40, 50);

a corresponding floor portion (60, 70); and

a corresponding corner portion (80, 90),

wherein the corresponding wall portion (40, 50) is attached to the corresponding floor portion (60, 70) at the corresponding corner portion (80, 90), wherein the corresponding corner portion (80, 90) is curved outwardly,

wherein the corresponding floor portion (60, 70) of each of the at least two L-shaped segment blocks (20, 30) are adapted to touch each other at a distal floor-edge (100, 102) of the corresponding floor portion (60, 70), for obtaining a U-shaped segment (105),

wherein the distal floor-edge (100, 102) of the corresponding floor portion (60, 70) is located distally from the corresponding corner portion (80, 90); and

a drain cover (110) adapted to be positioned above the U-shaped segment (105) for covering the U-shaped segment (105), thereby obtaining the drain segment of the storm drain system (140).

2. The structure (10) as claimed in claim **1**, wherein the at least two L-shaped segment blocks (20, 30) comprises at least two L-shaped precast concrete segment blocks.

3. The structure (10) as claimed in claim **1**, wherein the wall portion (40, 50) comprises a plurality of first openings (210), wherein the plurality of first openings

(210) is adapted to assist in lifting and positioning the drain segment during assembling of the drain segment for obtaining the storm drain system (140).

4. The structure (10) as claimed in claim **1**, wherein the corresponding wall portion (40, 50) is tilted outwardly by making a predefined angle with the corresponding floor portion (60, 70).

5. The structure (10) as claimed in claim **1**, wherein the drain cover (110) comprises:

a plurality of second openings, wherein the plurality of second openings is adapted to allow stormwater to drain into the drain segment when the stormwater flows over the drain segment; and

a plurality of paired projections (120) positioned on a cover-inner surface (130) of the drain cover (110), wherein the plurality of paired projections (120) are adapted to lock the drain cover (110) to the U-shaped segment (105), when the drain cover (110) is positioned above the U-shaped segment (105).

6. A storm drain system (140) comprising:

an assembly of a set of drain segments comprising:

a first set of drain segments (150) comprising:

at least two first L-shaped segment blocks (160, 170), wherein each of the at least two first L-shaped segment blocks (160, 170) comprises:

a corresponding first wall portion (180, 182);

a corresponding first floor portion (190, 192); and

a corresponding first corner portion (200, 202),

wherein the corresponding first wall portion (180, 182) is attached to the corresponding first floor portion (190, 192) at the corresponding first corner

portion (200, 202), wherein the corresponding first corner portion (200, 202) is curved outwardly,

wherein the corresponding first wall portion (180, 182) comprises a first indentation (220) on a wall-inner surface of the corresponding first wall portion (180, 182), at a set of first parallel wall-edges of the corresponding first wall portion (180, 182),

wherein the corresponding first floor portion (190, 192) of each of the at least two first L-shaped segment blocks (160, 170) are adapted to touch each other at a first distal floor-edge (240, 250) of the corresponding first floor portion (190, 192), for obtaining a first U-shaped segment (385),

wherein the first distal floor-edge (240, 250) of the corresponding floor portion (60, 70) is located distally from the corresponding first corner portion (200, 202),

wherein the corresponding first floor portion (190, 192) comprises a second indentation (260) on a floor-inner surface of the corresponding first floor portion (190, 192), at a set of first parallel floor-edges of the corresponding first floor portion (190, 192),

wherein the second indentation (260) comprises a first projection (280), and

a first drain cover (390) adapted to be positioned on top of the first U-shaped segment (385) for covering the first U-shaped segment (385), thereby obtaining the first set of drain segments (150); and

a second set of drain segments (290) comprising:

at least two second L-shaped segment blocks (300, 310), wherein each of the at least two second L-shaped segment blocks (300, 310) comprises:

a corresponding second wall portion (320, 322);

a corresponding second floor portion (330, 332); and

a corresponding second corner portion (340, 342),

wherein the corresponding second wall portion (320, 322) is attached to the corresponding second floor portion (330, 332) at the corresponding second corner portion (340, 342), wherein the corresponding second corner portion (340, 342) is curved outwardly,

wherein the corresponding second wall portion (320, 322) comprises a third indentation (392) on a wall-outer surface of the corresponding second wall portion (320, 322), at a set of second parallel wall-edges of the corresponding second wall portion (320, 322),

wherein the corresponding second floor portion (330, 332) of each of the at least two second L-shaped segment blocks (300, 310) are adapted to touch each other at a second distal floor-edge (350, 355) of the corresponding second floor portion (330, 332), for obtaining a second U-shaped segment (395),

wherein the second distal floor-edge (350, 355) of the corresponding second floor portion (330, 332) is located distally from the corresponding second corner portion (340, 342),

wherein the corresponding second floor portion (330, 332) comprises a first walled indentation on a floor-outer surface of the corresponding second floor

portion (330, 332), at a set of second parallel floor-edges of the corresponding second floor portion (330, 332), and

a second drain cover (400) adapted to be positioned on top of the second U-shaped segment (395) for covering the second U-shaped segment (395), thereby obtaining the second set of drain segments (290),

wherein the first set of the drain segments and the second set of the drain segments are arranged alternately, by positioning the second set of the drain segments above the first set of the drain segments,

wherein the first set of the drain segments are interlocked with the second set of the drain segments, when the third indentation (392) joins the first indentation (220) and when the first walled indentation receives the first projection (280), upon positioning, thereby obtaining the assembly of the set of drain segments for obtaining the storm drain system (140).

7. The storm drain system (140) as claimed in claim **6**, wherein the first set of drain segments (150) comprises a discharge drain segment (370) comprising the first floor portion (190, 192), wherein the first floor portion (190, 192) comprises a plurality of third openings (380),

wherein the discharge drain segment (370) is positioned above a recharge well for the discharge drain segment (370) to discharge stormwater to the corresponding recharge well, via the plurality of third openings (380).

8. The storm drain system (140) as claimed in claim **6**, wherein the corresponding first floor portion (190, 192) comprises a second walled indentation on the floor-inner surface of the corresponding first floor portion (190, 192), at a set of the first parallel floor-edges of the corresponding first floor portion (190, 192),

wherein the corresponding second floor portion (330, 332) comprises a fourth indentation on the floor-outer surface of the corresponding second floor

portion (330, 332), at the set of the second parallel floor-edges of the corresponding second floor portion (330, 332), wherein the fourth indentation comprises a second projection,

wherein the first set of the drain segments are interlocked with the second set of the drain segments, when the third indentation (392) joins the first indentation (220) and when the second walled indentation receives the second projection, upon positioning, thereby obtaining the assembly of the set of drain segments for obtaining the storm drain system (140).

9. The storm drain system (140) as claimed in claim **6**, wherein the assembly of the set of drain segments is adapted to be placed parallelly to one or more roads by maintaining a predefined distance between the one or more roads and the corresponding assembly, wherein the predefined distance comprises 24 inches.

10. The storm drain system (140) as claimed in claim **6**, comprises a crossover frame (530), wherein the crossover frame (530) is adapted to be positioned in between the assembly of the set of drain segments based on a predefined condition, wherein the predefined condition comprises positioning the crossover frame (530) when the assembly of the set of drain segments crosses over a sewage drain assembly (540).

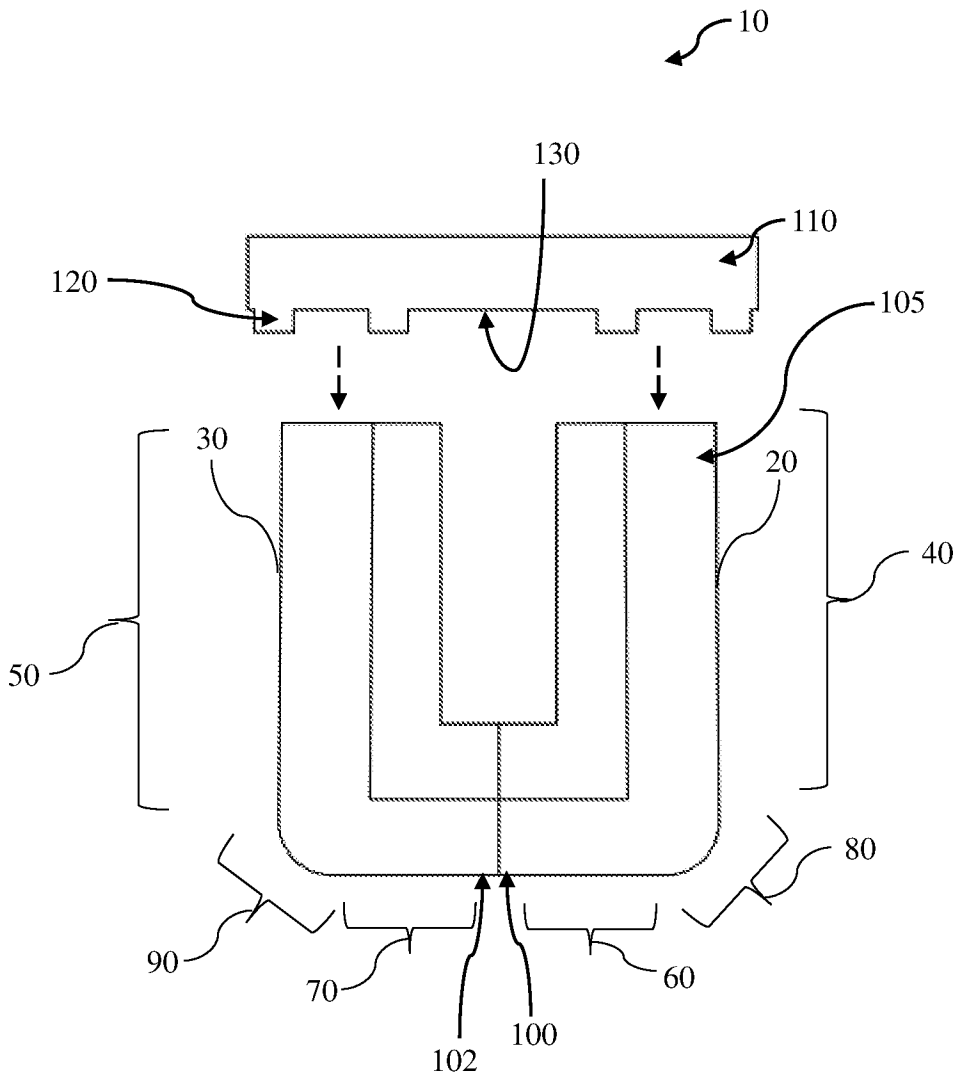
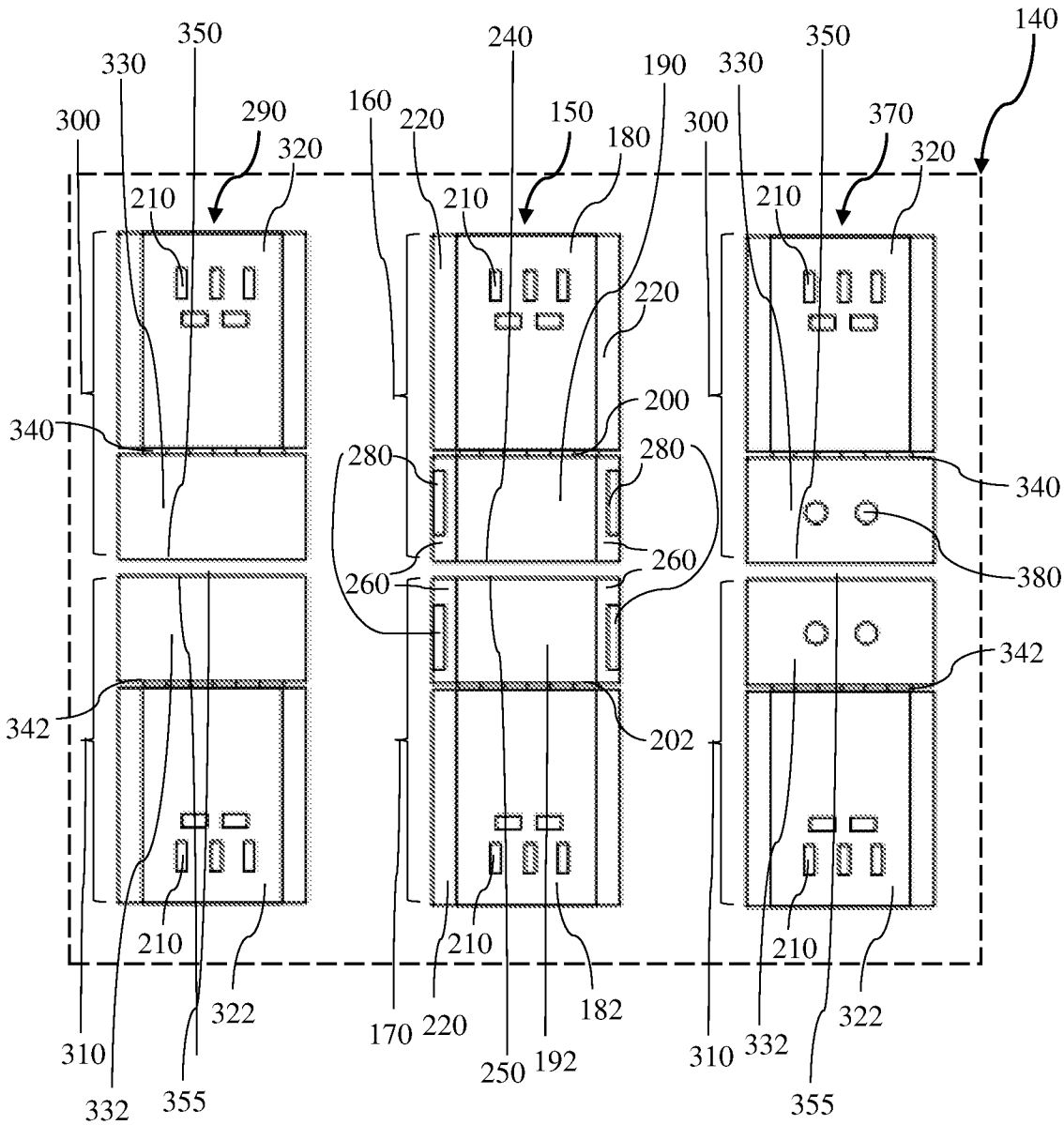


FIG. 1


140
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355

FIG. 2

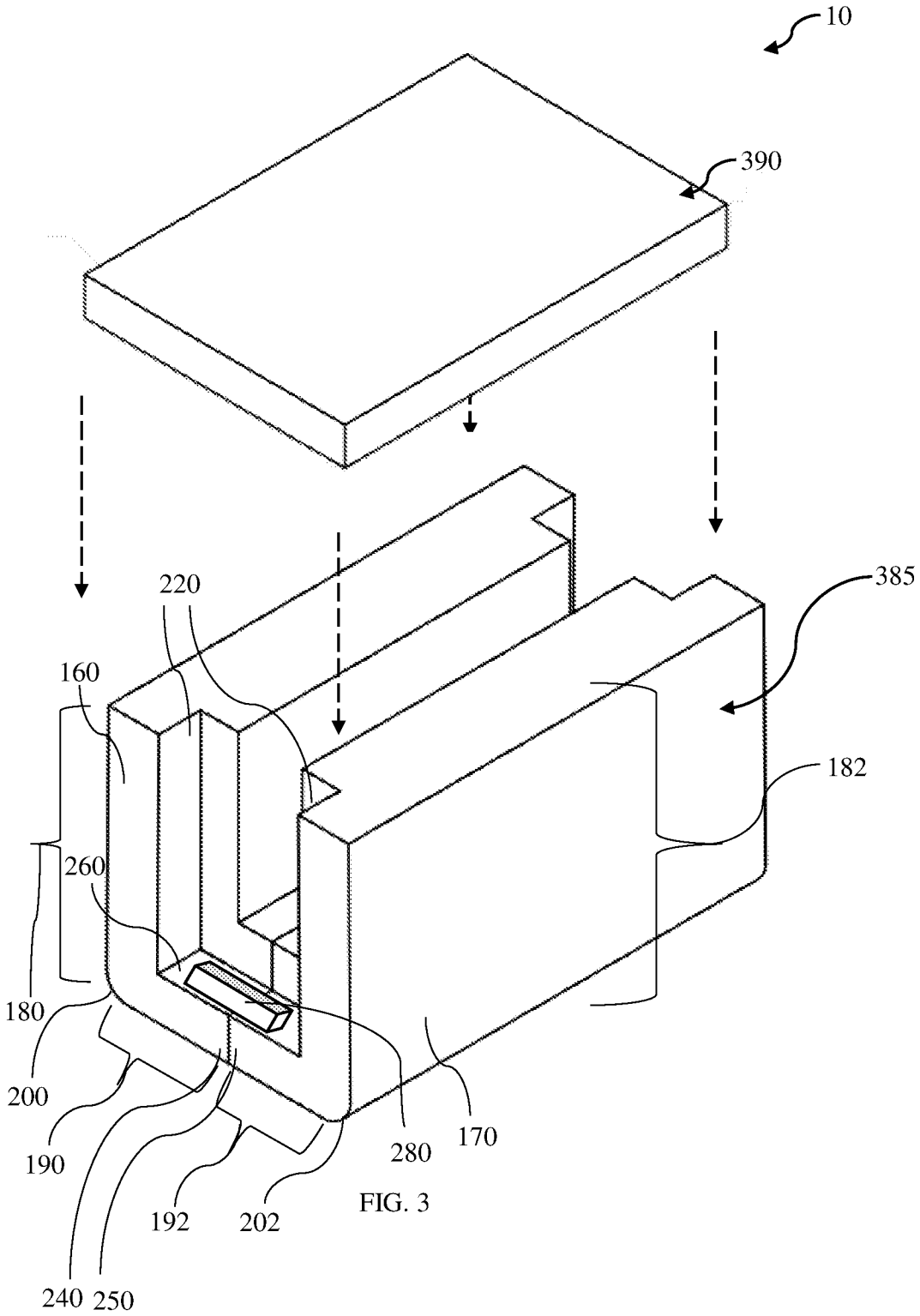

FIG. 3

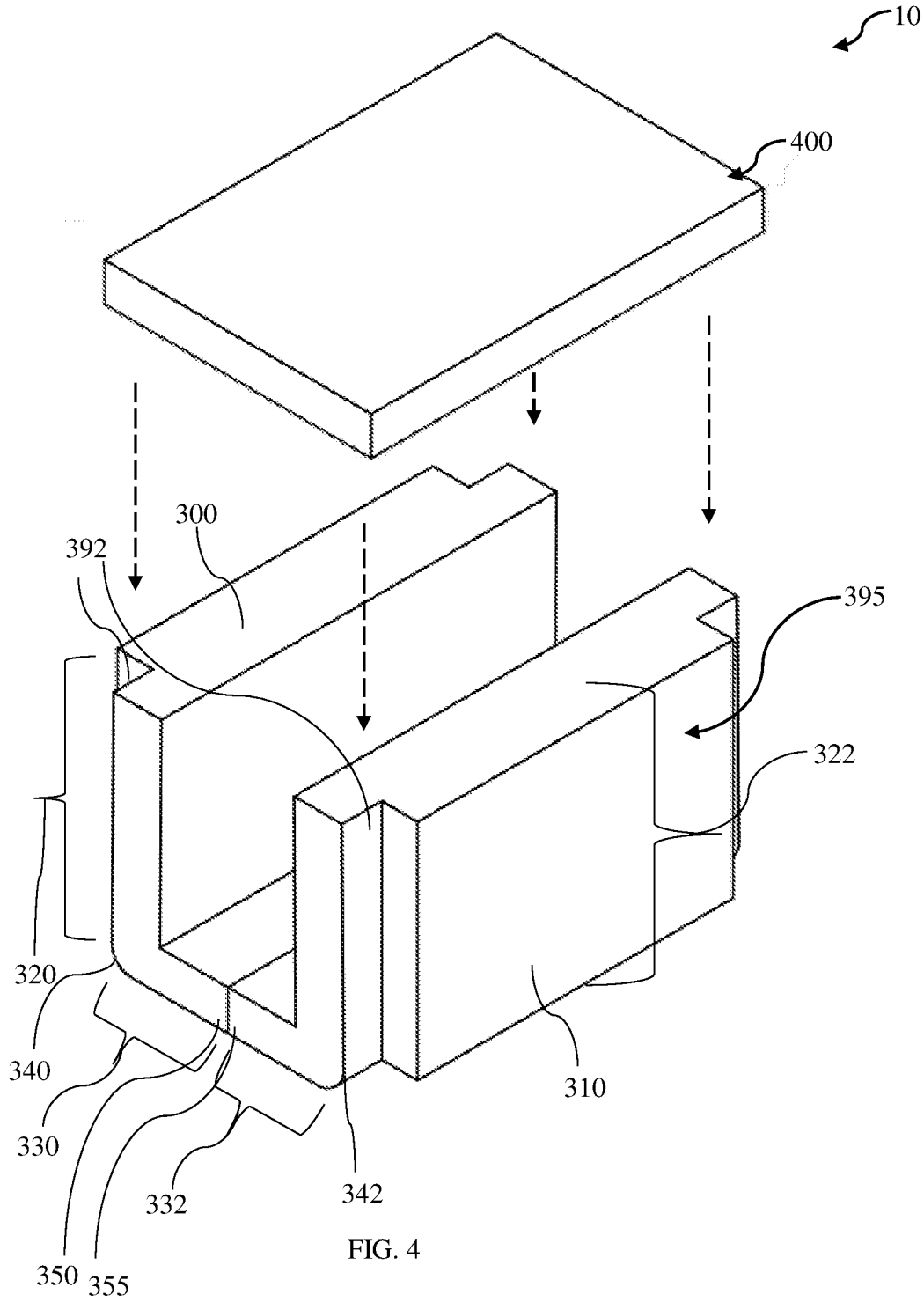

FIG. 4

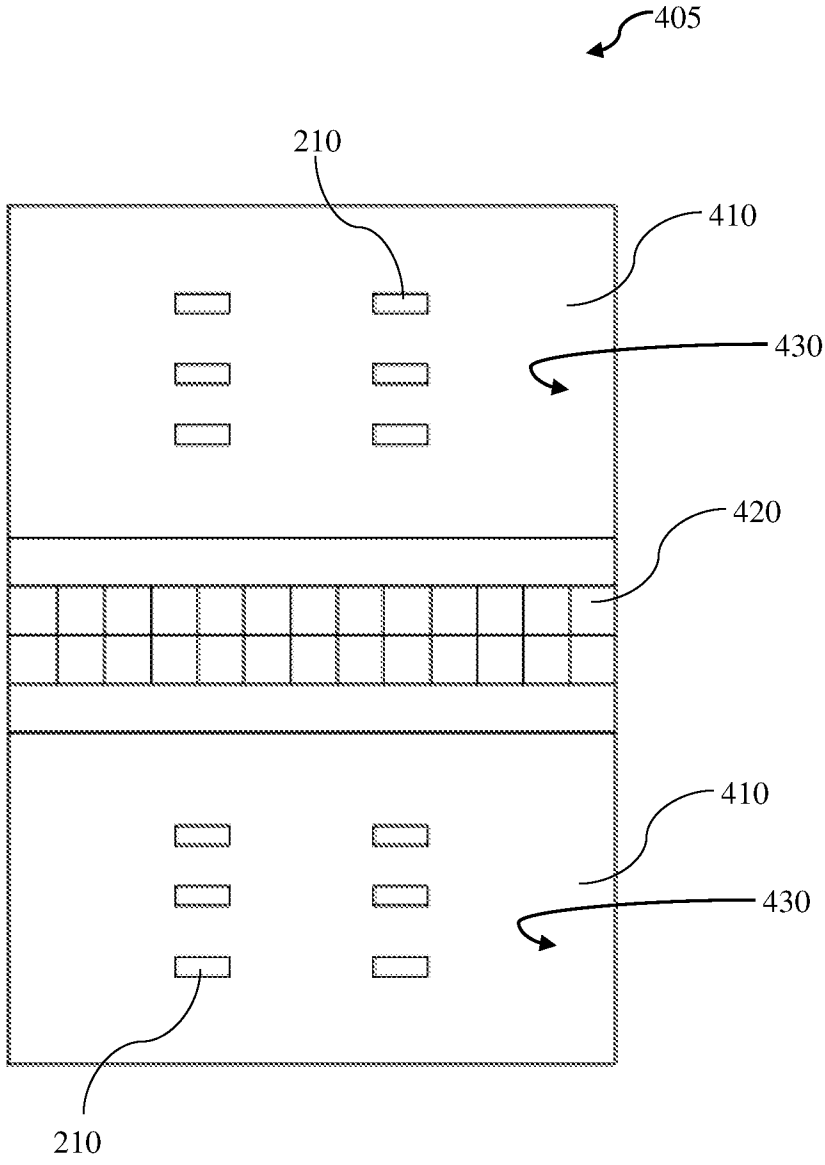

FIG. 5

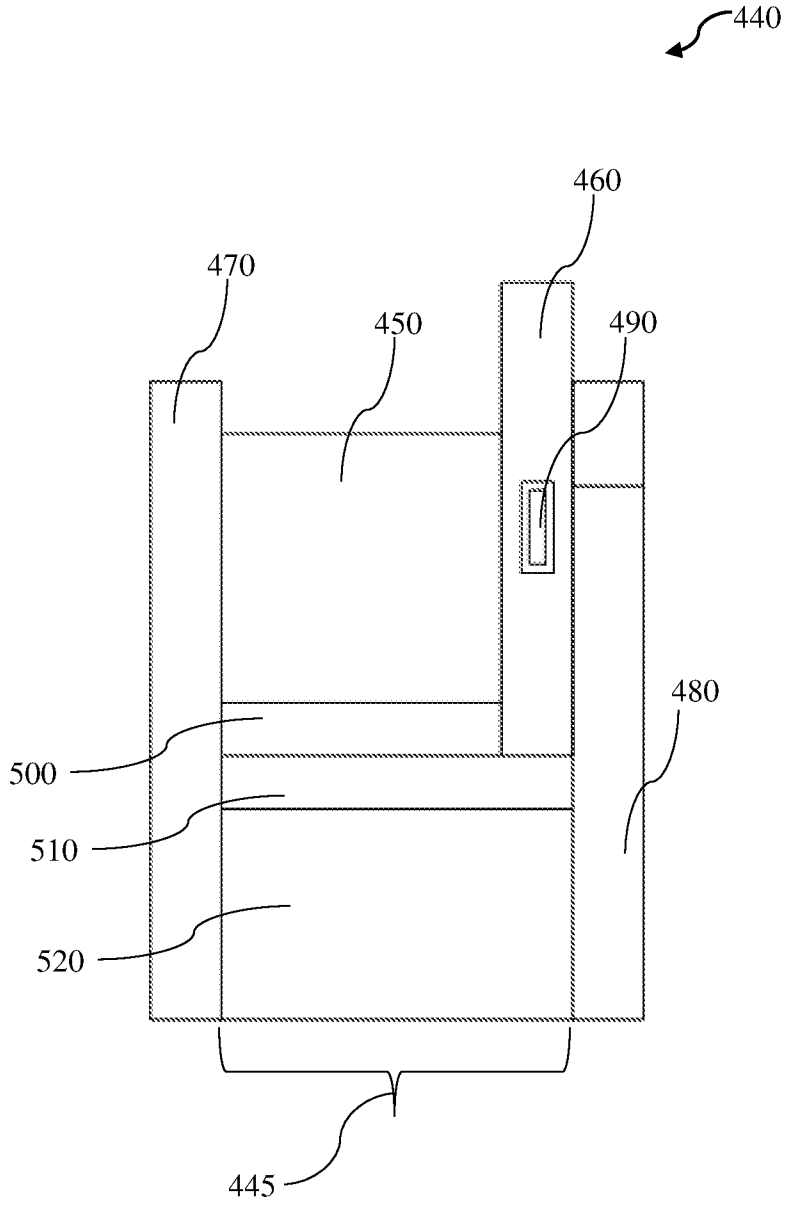

FIG. 6

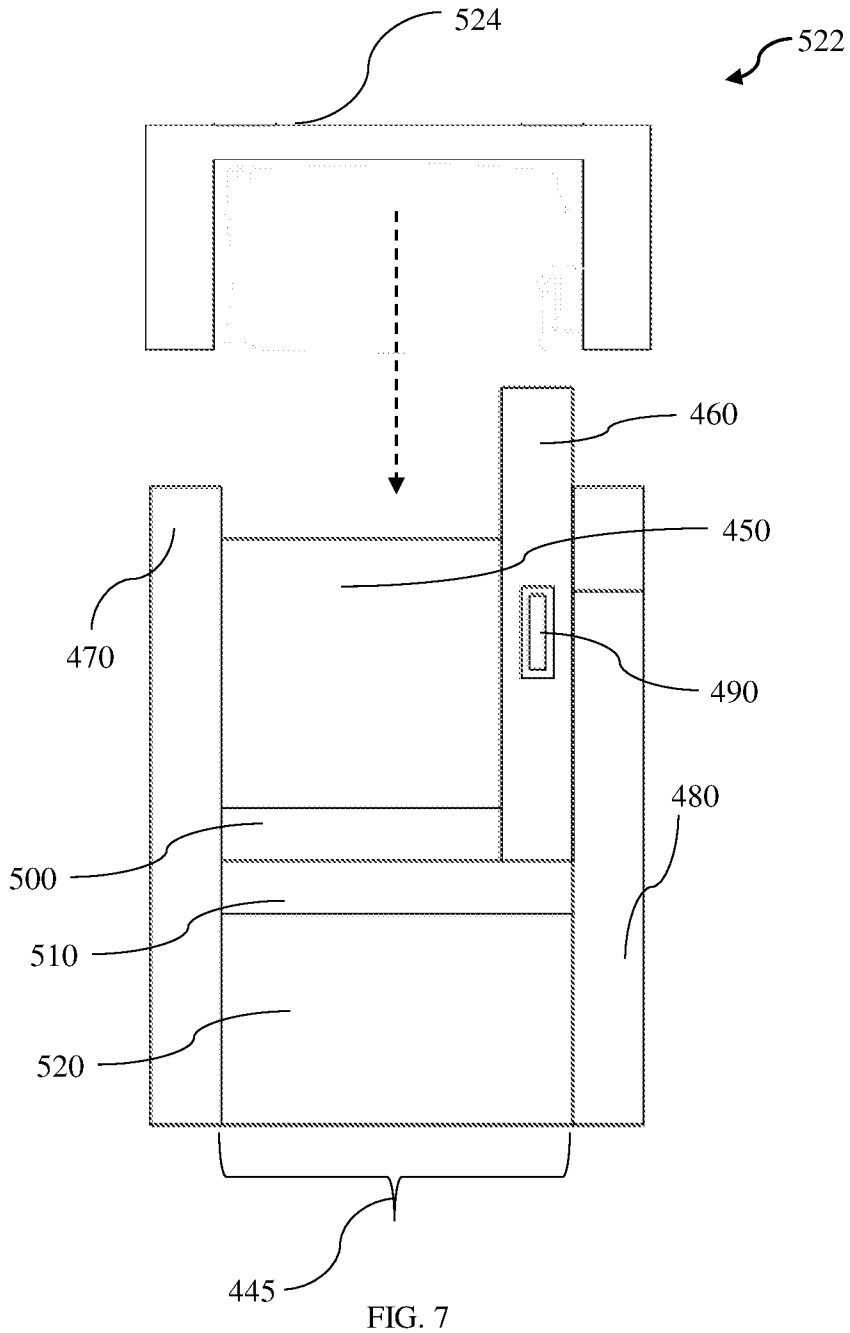

FIG. 7

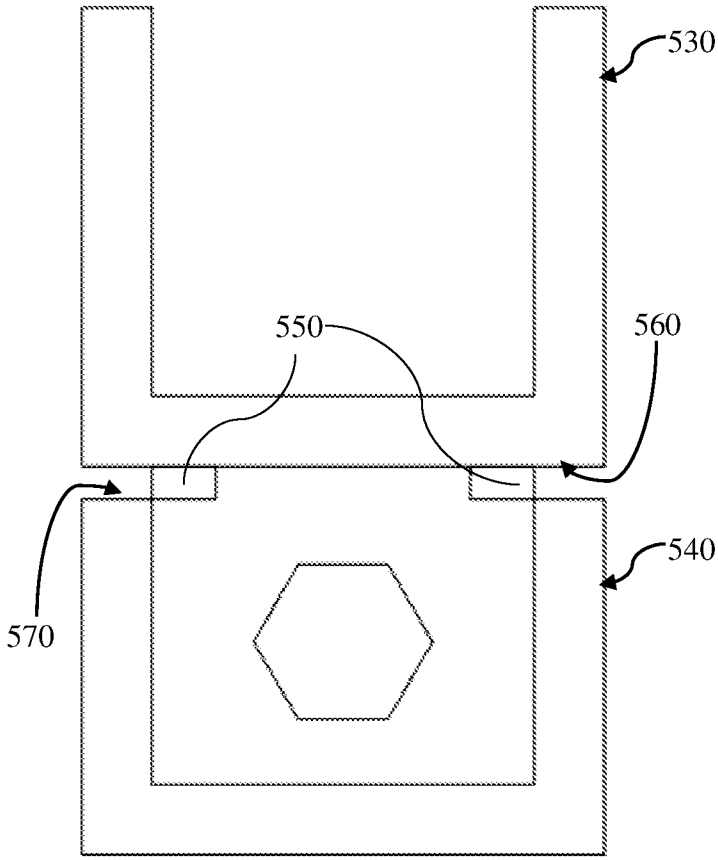

FIG. 8

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2022/057360

A. CLASSIFICATION OF SUBJECT MATTER
E03F5/04,E03F1/00 Version=2022.01

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

E03F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic database consulted during the international search (name of database and, where practicable, search terms used)

PatSeer, IPO Internal Database
Keywords: drain, L-shaped block, U-shaped block, Crossover, hole, cover

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	KR101008421B1 (SO Jae Chul) 14 JANUARY 2011 (14.01.2011) Abstract; Whole Description; Claims 1, 4, 7, 9, 12	1-10
A	US2021363742 A1 (OATEY CO.) 25 NOVEMBER 2021 (25.11.2021) Abstract; Description, Paragraph 0042; Description, Paragraph 0052; Description, Paragraph 0056; Claims 1, 9	1-10
A	KR20140001756 U (YUTAEJONG) 26 MARCH 2014 (26.03.2014) Abstract; Whole Description Claim 1	1-10

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
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"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
15-11-2022	15-11-2022
Name and mailing address of the ISA/ Indian Patent Office Plot No.32, Sector 14,Dwarka,New Delhi-110075 Facsimile No.	Authorized officer Shivanshu Mohan Singh Telephone No. +91-1125300200

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/IB2022/057360

Citation	Pub.Date	Family	Pub.Date
US 2021363742 A1	25-11-2021	CA 3119281 A1	21-11-2021