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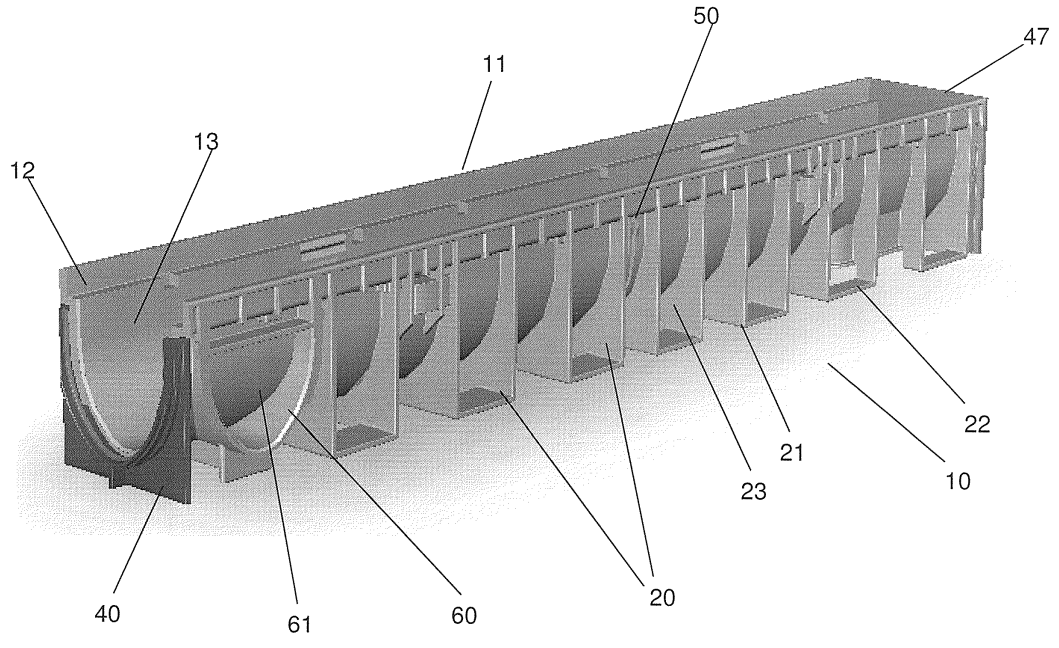
(54) Drainage gutter system

(57) A modular drainage gutter system is described, in particular for surface water drainage, with at least one gutter body (10) having on its upper edges (11) an edging element (12) for supporting a covering grate or other covering means. The gutter body (10) has supporting elements (20) for supporting it on an underlying surface and is provided with connecting means (30) for connection to a plurality of further gutter bodies, gullies or similar water drainage means. The system further comprises coupling means (40) which connect together two gutter bodies (10) by means of the connecting means (30). The coupling means (40) are formed to enclose the connecting means (30) from the outside, and to seal the gutter bodies against each other. Furthermore, these means can be used as support as they have bearing means (41) on their under faces (42), which are dimensioned such that after connection of a coupling means (40) with at least one gutter body (10) the bearing means (41) are in alignment with the supporting elements (20) of the gutter body (10).

Figure 1



EP 1 881 118 A1

Description

[0001] This invention relates to the field of drainage gutter systems for the removal of unwanted liquid, and integration of such systems with underground drains and sewer systems, according to the preamble of claim 1.

[0002] Most countries in the world, indeed some more than others, are subjected to rain, snow and other forms of natural precipitation. When this water falls on open land, it is absorbed and drains away naturally. This is not the case, however, when water falls on the extensive road and path networks prevalent throughout the world. Roads and footpaths are typically fabricated from non-porous materials such as concrete, asphalt and the like, and water landing on these materials will not be absorbed. With only a little rainfall, surface water can build up and lead to pooling. Such pools of water provide a nuisance to users of footpaths, but more seriously a real hazard to road users.

[0003] The formation of surface water on roads and paths, is of particular concern in built up areas, where there is little or no natural drainage available. It poses additional problems, when on motorways or other significantly large roads, as these are generally wide and once again natural drainage of the water cannot be guaranteed. In light of this, it is necessary to provide roads and pathways with adequate drainage means, so as to allow the controlled and safe removal of such water.

[0004] Typically, road and pathways are provided with drainage channels or gutters which run the full length of the road, and often at both sides. Such drainage is usually provided when the road is laid, and is used for allowing surface water to drain directly into the channels for transportation either to natural streams and rivers, or more commonly to an access point to underground sewers and the like.

[0005] In the main, the gutter channels are provided from prefabricated individual units, which are constructed into the full system at the time of laying the road or path. In light of this, it is necessary to provide a readily and easily usable system, wherein the individual components can be combined at the point of use. Furthermore, it is advantageous if these components are easily manufactured and versatile in their final deployment.

[0006] EP 0 357 895, discusses a system and method for assembly and installation of a drainage trough. In this document, the drainage channels are preformed, and are then positioned next to each other at the point of use. They are provided with openings and grooves for the further application of sealing elements, which are applied after the segments are rigidly joined together. Furthermore, discussion is presented that the joints between these adjacent segments are provided with a stiffening joint sealant.

[0007] US 5,518,336, discloses a drainage gutter system, wherein the channels are formed preferably from a concrete polymer. Discussion is presented of providing the joints between adjacent channel pieces with slots for application of sealant strips. These strips are designed to be deformed to form a water tight joint, when the two channels are brought into abutment. The joining of these channels, is discussed by the provision of bolts through holes in flanges provided on the sides of the channels, or by the use of a bracket which fits around the joint and holds the ends in place.

[0008] It is an object of the current invention, to provide a cheap and versatile drainage gutter system for easy assembly and installation at the point of use, preferably without the need for screws, bolts or other joining means.

[0009] The above problems are solved by the drainage gutter system according to claim 1. Further preferred embodiments are presented in the dependent claims thereof.

[0010] The drainage gutter system according to the present invention, is based around the provision of a modular system which comprises numerous gutter body sections. It is a requirement that these gutter bodies be provided with a covering grate or other covering means, and as such, edging elements are provided at the upper sides of the gutter body. Additionally, for ease of use and installation, each of the gutter bodies are provided with a series of supporting elements upon which the gutter body rests. These supporting elements or means, provide a method of stably positioning the gutter body on the underlying surface. In order for multiple gutter bodies to be connected together, connecting sections, parts or means are provided at the open ends of the gutter body channels, and provide a simple and reliable mechanism by which the bodies can be joined. Separate coupling sections, collars or means are provided which can be integrated simply and without the need for further tools, with the connection means at the ends of the gutter body sections. In such a manner, it is quite straightforward to couple together multiple gutter bodies in order to provide the drainage gutter system of the required shape and size at point of use.

[0011] In particular, the coupling means are provided and formed such that they completely enclose the ends of both of the gutter body sections which are being joined together. In particular, they interact with the connecting means at the ends of the gutter bodies, enclosing them from the outside and generating a solid seal between the abutting gutter drain bodies. An additional feature of these coupling means, is that on their undersides they are provided with bearing means which can be used to further support the joint region between two adjacent gutter bodies on the underlying surface. Clearly, any joint between adjacent gutter bodies is likely to be a weakness, and such coupling means provide the required additional strength to the system to overcome this problem. In particular, the coupling means are shaped and sized such that they provide, when in use, a structure which has the same dimensions as the supporting elements.

[0012] Preferably, the gutter bodies are provided with further connecting means, which will allow the gutter bodies to be connected together at angles with respect to

each other. Such a branched-off connection, will allow for the gutter bodies to form a system which can be used in a variety of situations.

[0013] In order to provide the gutter bodies with multiple uses, it is preferable that the side connecting means, do not open into the central channel provided in the gutter body. Instead, the channel is provided complete, and when such a side connection is required the channel side wall is broken in the region of the side connector. In this manner, identically fabricated and manufactured gutter bodies can be used in a variety of system configuration.

[0014] Rather than providing gutter bodies of different lengths, it is preferable to simply manufacture and provide one gutter body and to shorten this as required. To this end, longitudinal portioning sections may be provided along the outer surface of the channel region of the gutter body. Such longitudinal means, provide a method whereby the gutter bodies can be shortened as required, and still integrated with the system in the same manner as the normal gutter bodies.

[0015] As discussed above, it is necessary to provide the gutter bodies with mechanisms whereby covering grates or means can be integrated with the upper surfaces of the bodies. This is also required, when using the side connections for branched-off connection of multiple gutter bodies. To this end, it is preferable to provide a supporting means with which the grate or covering can interact, which is positioned above the section of the gutter body channel which may be broken through.

[0016] In order to provide a system which can readily be put together at the point of use, it is preferable that the connecting means and the covering means interact in a straightforward manner. In particular, the coupling means may interact with the outside of the connecting means provided on the gutter bodies, in a snap-in/snap-on engagement mechanism. With provision of this, the end user can readily connect pieces of gutter body together as required, without the requirement for additional tools. Also, it is possible to rearrange used gutter body sections, as they have not been permanently fastened together.

[0017] As the drainage gutter system is intended for use with liquids, it is preferable that the gutter bodies provide a watertight seal between adjacent members. In particular, the coupling means may have integrated sealing elements, which interact with the connecting means at the ends of the gutter bodies, or through the branch-off connection points, so that when multiple gutter bodies are connected together a watertight seal is obtained. Such sealing elements may be provided by simple elastomer strips or any other watertight sealant provided on the coupling means.

[0018] It is preferably possible to provide the gutter bodies with different widths and heights, depending upon end requirements. To this end, coupling means may be provided which can be used to seal against the ends or branched-off connection points of both differently sized gutter bodies, and provide a mechanism for joining the two together.

[0019] Rather than providing specific gutter bodies in which one end is completely sealed, thereby providing the first or last gutter body in a drainage channel system. It is preferably possible to provide one of the coupling means with a plate-like element, which can be used as an end to gutter bodies. In this manner, any of the gutter bodies can be used as the start or end to the drainage system, and simple integration of the end type coupling means will provide for a watertight seal.

[0020] In order to allow the system once in place to settle over time with usage, it is possible to provide a coupling means which leaves a small gap between the two ends of the abutting gutter bodies. This small gap may then be filled with an appropriate sealing means, to provide a watertight seal. Over time, if the system is subject to settling, it is possible that the abutting ends of adjacent gutter bodies will move further apart. The provision of this gap with sealing means, will allow for a certain degree of settling to occur, without the loss of watertight seal between the two gutter bodies. If, however, a great deal of settlement should occur, it will be a straightforward matter to refill the gap with a new sealant means and therefore repair the system.

[0021] In order to allow the gutter bodies to be most readily positioned in an underground location, a gap is preferably provided between the supporting elements on the underside of the channel region, and the channel itself. Such a gap, will allow for the infill around the sides of the gutter body, to completely fill the gap and provide full support to the channel region.

[0022] The supporting elements on the side of the gutter bodies, are preferably provided by reinforcing sheets the surface normal of which lie along the axis along the centre of the gutter body. Such sheets, may be formed to start from the upper edge of the gutter body, and progress substantially downward to provide the underground support means. Additionally, such a system would provide lateral reinforcement to the gutter body sections.

[0023] So that liquid travelling through the gutter body system, can be drained into underground sewerage or drainage means, the gutter body is preferentially provided with at least one drain connection point. This is preferably provided on the underside of the drainage channel, and is shaped such that it extends to the same amount as the supporting means, thereby providing a further mechanism of support for the channel. This drain connection, can be integrated with an underground drain or pipeline, by means of an adapter. This adapter integrates with both the drain connection and the pipeline below, to provide a watertight seal for drainage of liquids.

[0024] Once again, so that individual gutter bodies may be provided for multiple uses, it is preferable that the drain connection does not provide an open passage way to the inside of the drainage channel. Preferably, this connection is sealed, and the drainage channel is broken through as required.

[0025] Preferably, in order that the drain adapter provides a watertight seal with the gutter body, sealing means are provided at the joining point. Once again, the sealing means may be provided by a deformable sealant strip, or any known deformable elastomer.

[0026] The drain adapter, is preferably provided with hooking connections, which can be snapped into relevant eyelets or means provided on the underside of the gutter body. This provides for a tool free fixing mechanism, which can once again be removed or changed as required.

[0027] It is finally preferable, that each of the elements described above, is moulded from a plastic, preferably a thermoplastic, and more preferably that only a limited range of sizes and shapes are provided. In so doing, this improves ease of manufacture and further integration with other elements at the point of use.

Figure 1 shows a single gutter body section, for use in forming the drainage system.

Figure 2 details the end of the gutter body of figure 1, and additionally a coupling means for joining multiple body pieces together.

Figure 3 shows three examples of drainage gutter bodies of differing heights, showing some of the options for the system.

Figure 4 comprises two examples of coupling bodies for connecting differently sized gutter body sections together.

Figure 5 details two gutter bodies connected at right angles to each other.

Figure 6a shows a drain adapter connected to the underside of a gutter body.

Figure 6b is a side view of the gutter body and drain adapter in figure 6a.

Figure 7 is a detail view of the drain adapter in figures 6a & 6b.

Figure 8 is an overview showing a system comprising many of the elements of the current invention.

[0028] Figure 1, shows one section of a modular drainage gutter system, which can be seen in figure 8, of the current invention. This system is designed to provide a simple and versatile method of creating drainage channels for the removal of water. In particular, it is envisioned that the system will be utilised for the removal of surface water, for example from roads or paths. Additionally, as will be discussed below, this system can readily be integrated with existing underground drainage systems.

[0029] Primarily, this system is directed toward providing drainage systems which are held substantially under ground level. That is, the drainage channels and gutters are provided at the edges of paths and roads and the like, with the tops of such units being level with surrounding ground, and the majority of the unit being contained underground. It is envisaged, that such drainage systems will be of particular use when building new roads or pathways, and that they be specifically incorporated within the design of such. Clearly, however, the system as described below can find use in any number of environments where the removal of water is required, and can be installed to existing roads to replace worn out or less effective drainage systems.

[0030] With consideration of using such drainage systems alongside roadways and the like, the incorporation of the elements is intended to be straightforward. In the required positions, usually at the side of a road or pathway, a specific trench is made with an appropriate gradient and a solid underlying layer is provided. The elements of the drainage system are constructed according to the specific requirements, as will be discussed fully below, and the drainage channels will be positioned into the trenches. At this point, the trenches will be in-filled and the drainage system fully integrated with the surrounds. It is clear, however, that the drainage system need not be limited in use in the above described manner. The drainage system could equally well be used entirely above ground, with the elements fabricated as required and then positioned on the ground or even atop a raised supporting structure. Indeed, as will be seen below, the system is versatile enough to be able to provide both above and below ground drainage in the same system, as well as full integration with existing drainage points and systems. The final use for the product, clearly determines the exact arrangement and choice of the system components.

[0031] As is seen in figures 1 and 2, the complete drainage system is made up from individual gutter bodies 10, which are prefabricated and intended for connection together at the point of use. The gutter bodies 10, provide a channel 13 in which the water is collected, and along which it subsequently flows. The figures each show that the channel 13 is parabolic in cross section, providing a curved base 14 which forms into approximately vertical sides 15 at the top of the gutter body 10. Such a shape advantageously leads to a high flow rate of liquid through the gutter body 10, even when there is only a small amount in the channel 13. This increased flow rate, will act against the build up of silt and/or debris in the gutter body 10, helping to keep the system clean. The channel 13 is not limited to this particular shape, however, and indeed it is anticipated that any curve is possible depending upon the requirements in the system. Furthermore, the curved base 14 need not lead smoothly into the side walls 14 of the channel 13, instead it may transition through an abrupt angle. Also, the lowest point of the channel 13 need not be formed from a smooth curve, but

may pass through a vertex like point. One final option, is for the channel 13 to be possessed of a flat base, with or without curved sides leading to this.

[0032] It is intended, however, that generally the channels 13 will be formed in a series of standard widths, heights and shapes, to allow for more straightforward fabrication and ease of manufacture. It is clear, however, that the drainage system can be provided with gutter bodies 10 which have any width, height or shape, dependent upon final requirements. As will be shown later, it is also possible to combine gutter bodies 10 of different width, height and shape together, to improve the flexibility of the system.

[0033] At the upper edge 11 of the gutter bodies 10, is provided an edging element 12. This edging element 12 is designed for supporting a covering grate or other suitable covering means, such that the top of the gutter body 10 is not open. Not only would this grate or cover provide a mechanism for stopping unwanted material, such as leaves or rubbish, from entering the gutters 10, but it would also mean that the channels 13 do not present a hazard for pedestrians, cyclists, motorists or the like. Indeed, it is intended that the covering grate, would provide a suitably robust and stable surface upon which objects and people could traverse or rest. The edging element 12, is most simply constructed as a shelf like structure on either side of the channel 13, near the upper edge 11 of the gutter body 10; upon this, it is possible to simply rest appropriately sized cover grate elements. Additionally, it is possible to include fixation and positional elements integrated with the edging element 12, for holding the cover grates in position. So that there are no gaps between adjacent cover grates, it is anticipated that they may be formed with overlapping sections, such that part of one grate is positioned, and may optionally be fixed, underneath the adjacent cover grate.

[0034] Provided on the outside of the gutter channels 13, as is clearly shown in figure 1, are a series of supporting elements 20. These elements 20 are a series of flat, rigid sheets which are positioned at intervals along the length of the gutter body 10. Such sheets, lie with their surface normal parallel with the direction of the axis formed along the length of the body 10. The sheets are rectangular, or even square, in shape, and are provided with a cut out from one side, which matches the shape of the channel 13. It is anticipated, that the supporting elements 20 will be slightly wider and deeper than the channels 13 of the gutter body 10, so that they fully surround the sides and underneath portions of the curved section. Preferably, these supporting elements 20 are further formed perpendicularly to the edging elements 12, and progress downward in an approximately vertical manner. This gives the most stable support to the channel 13, and further helps strengthen the whole gutter body 10. Other options for these supporting elements 20 are possible, however, for example they need not be perpendicular to the axis of the channel 13 and/or the edging elements 12. Furthermore, they need not fully surround the whole width of the channel 13, and could be of the same or smaller width than that of the channel 13, should space outside the gutter body 10 be limited.

[0035] The supporting elements 20 are two-fold in purpose. Initially, the supporting elements 20 lead to an increase in the strength and rigidity of the gutter body 10 along the length of the sections. Additionally, the supporting members 20 are used to support the gutter body 10 when it is placed on the underlying supporting surface. That is, the lower edge 21 of each member 20 rests on the ground and acts like a foot, supporting the weight of the gutter body 10. Furthermore, each of these supporting members 20 could be provided with a wider lower edge 21, or an additional supporting plate at approximately right angles to the plane of the members 20 for resting on the ground and to reduce the pressure from each member 20. Another possible design for such can be seen from the figure, wherein two adjacent members 20 have a flat surface section 22 formed between them at their lower edges 21 respectively. This forms a solid surface upon which to support the gutter body 10, increasing stability and further decreasing the pressure applied to underlying portions of the supporting ground.

[0036] A further advantage which arises from the provision of the flat surface sections 22 between the lower edges 21 of adjacent supporting members 20, or wide plate like feet attached to the lower edges 21 of the supporting members 20, is that the gutter body 10 is properly held within the ground cavity by the infill. When the gutter bodies 10 are placed within the ground for removing surface water, the gap between the outside surface of the channel 13 and the trench provided in which the gutter body 10 sits, will be filled in. This may be accomplished by means of soil, concrete, rubble or the like, or a combination of each of these, depending upon where the drainage system is to be used. For efficient infilling, it is necessary for there to be a gap 23 between the flat surface sections 22 on the supporting members 20 and the external surface of the channel 13. Additionally, the weight of the infill material will act down on the top of the flat surface sections 22, and will actually hold the gutter bodies 10 in place. This is particularly important, if the surface water table actually rises above the lowest point of the channel, as this would act to push the channel upward and out of its setting within the ground.

[0037] The individual gutter bodies 10, as detailed in figure 1, are designed such that they can readily be connected to further gutter bodies 10. In particular, the interconnection is intended to be performed without the need of additional tools. In this manner, the inter-connection is achieved by a combination of connecting means 30 provided on the gutter body 10, and a separate coupling means 40 which interacts and interlocks with the connecting means 30 enclosing them from the outside. These features are best seen in figure 2. As can be seen from the figure, at the open end of the channel 13 of the gutter body 10 there are provided connecting means 30 on the outside surface of the channel section. These

means 30 are in the form of a flange or lip 32, which extends in a direction outward from the channel 13, parallel with the plane of the sheets forming the supporting members 20. The flange 32 making up the connecting means 30, is used to slide into a corresponding slot 33 formed on an inner surface of the coupling means 40. Coupling means 40, comprises a separate section which is preferably shaped and sized to match the supporting means 20. That is, the coupling means 40 is a rectangular or square sheet, which may be wider and taller than the channel 13 making up the gutter body 10. Within the curved surface section of the coupling means 40, is provided the slot 33 which is designed to accept the flange 32 at the open end of the gutter body 10. Clearly, the slot 33 is wide enough to accept the two adjacent flanges 32 when two gutter bodies 10 abut, thereby connecting the two bodies 10 together. By making the coupling means 40 the same size as the supporting means 20, a further supporting means or bearing means 41 positioned on the under face 42 of the curved section, is introduced in the system each time two gutter bodies 10 are joined together. Furthermore, as the bottom of the coupling means 40 is sitting on the underlying surface, there is no weakness in the joint region of the system, and no strain is placed on the joint when the gutter body 10 is full of liquid.

[0038] The flange 32 of the connecting means 30, is shown in figure 2 as being from the top of each side of the channel 13 to part way down the side of the channel 13. Clearly, this is not intended as a limitation to the system, and is merely by way of example. The flange 32 could, for example, be provided around the whole outer surface of the channel 13 in the gutter body 10, for positioning within a corresponding slot of the coupling means 40.

[0039] In one preferred embodiment, the flange 32 is provided extending approximately two-thirds of the way down the side of the channel 13. Additionally, this interacts with a correspondingly shaped slot in the coupling means 40. In providing such an arrangement, there is no slot provided in the bottom section of the coupling means 40, which avoids the build up of particulate matter. When fastening together the two ends of the gutter body 10, it is necessary for the inner section of the coupling means 40 to be clean, so that the gutter body 10 sits properly on the coupling means 40 and forms a good seal. Providing the parts as so described, means that the inner surface of the coupling means 40 has a smooth and readily cleanable lower section, which promotes the water tightness of the seal.

[0040] It is intended that the coupling means 40 will hold the ends of the gutter bodies 10 in sufficiently tight abutment, that a water tight seal is obtained. For additional water tightness, it is possible to provide the coupling means 40 with a sealing element 43. This sealing element 43 could comprise an elastomer strip which is positioned within the slot 33 of the coupling means 40, and is brought into contact with the gutter body 10 or connecting means 30 when two gutter bodies 10 are connected together. Further sealant materials are possible for the sealing element 43, and are considered as falling within the general knowledge of the person skilled in the art. Primarily, any material which is non-permeable to water, and which will deform to create a water tight seal when the coupling means 40 are engaged, is appropriate in this case.

[0041] As a further feature in the joining of multiple gutter bodies 10, it is possible to provide the coupling means 40 of such a size and width, that a deliberate gap is provided between the abutting ends of the gutter bodies 10. It would then be possible to fill this gap between the two adjacent ends, with a sealant material. This sealant would preferably be of an elastomeric nature, such that it would form a watertight seal between the two gutter bodies 10, whilst additionally allowing for the two gutter bodies 10 to move relative to each other. Such a design, would allow for the drainage system to adapt to a certain amount of settling of the ground level with time, without losing the water-tightness of the joining sections. Furthermore, should a great deal of settling occur over a long period of time, it would be possible to reapply the gap filling sealant, and therefore prolong the life of the system without replacement of gutter bodies 10. It is intended, that the coupling means 40 in this design, operate in the way described above, and further optionally include the sealing element 43.

[0042] In order that the coupling means 40 are properly fixed to the gutter bodies 10, fixing means may be provided on each. It is intended that the fixing together of these parts will be achieved without the requirement of further tools, and in a readily adjustable manner. As can be seen best in figure 2, the connecting means 30 on the gutter body 10 may further be provided with clips 31. These clips 31 are shown at the top of the flanges 32 comprising the connecting means 30, however, they need not necessarily be limited to this location. It is possible to position the clips 31 in any location which interacts with the coupling means 40. The clips 31 are shown as having a flat upper surface which extends outward from the flange 32, below this surface is provided a tapered section which joins up with the outer surface of the flange 32 of the connecting means 30. Provided on the coupling means 40 in the corresponding location, is the mating clip for snap-in/snap-on connection. When the coupling means 40 are positioned over the end of the gutter body 10, the flange 32 of the connecting means 30 slides within the slot 33 or space provided on the coupling means 40. Prior to complete engagement of these two means, the respective clips of the fixing means will meet and be forcibly engaged with each other. At this point, the coupling means 40 and the gutter body 10 will be held together. It is anticipated, that the clips 31 will be positioned such that they engage with each other at the point that the flange 32 of the connecting means 30 is fully positioned within the slot 33 of the coupling means 40.

[0043] As was discussed above, it is possible for the

gutter bodies 10 to have different cross sectional profiles. A selection of such can be seen in figure 3. Whilst this figure only shows three different gutter bodies 10 with different heights, it is to be understood that it is also possible for the gutter bodies 10 to be possessed of different widths. Clearly the choice of dimensions for the gutter bodies 10 will be determined by the end usage, however, it is quite likely that different sized sections will require connection together. This is most readily achieved by means of specific coupling means 45, 46 sections. As can be seen in figure 3, the gutter bodies 10 are all possessed of the connecting means 30, which may also include the clips 31, for connection in the same manner as is disclosed above with relation to figures 1 and 2.

[0044] As can be observed in figure 4, two different coupling means 45, 46 are depicted for connecting together gutter bodies 10 with different cross sectional profiles. The coupling means 45, 46 of figure 4, are intended to be utilised for connecting gutter bodies 10 together as in the case discussed above with relation to the simple coupling means 40. In light of this, further discussion as to the operation and interaction will not be duplicated. One key issue, however, is that the coupling means 45, 46 are shaped so as to match the size of the supporting means 20 on the larger of the gutter bodies 10. That is, they will provide a suitable strengthening section at the joining point, and are intended to rest upon the underlying surface below the taller of the gutter bodies 10.

[0045] In figure 4, as in figure 3, the coupling means 45, 46 are shown for the situation where the height of the channels differs. The mechanisms for interconnection, are standard whether considering two gutter bodies 10 of the same height, or two of differing heights. The coupling means 40 are not intended to be limited to just these options. As would be obvious to the skilled person, coupling means 40 could be provided which would allow the interconnection of gutter bodies 10 of different widths. Additionally, coupling means could be provided for joining together bodies 10 which have the same cross section, but which are to be utilised at different vertical positions from each other. That is, the coupling means 40 could provide a step between identical gutter bodies 10. It is to be understood, that any combination of connections is possible by the coupling means 40 above, such as different width bodies and different height bodies connected together, and such like. All of these are considered as being within the scope of design options considered by the person skilled in the art.

[0046] An additional important function which can be performed by a further design of the coupling means 40, is that of a gutter end piece 47. Whilst it is possible to form a specific gutter body 10 which has one end closed off, such that it provides the first or last piece in a drainage gutter system, a more flexible approach is to provide a removable gutter end piece 47. This allows for any gutter body 10 to be used as the first or last in the system, and further removes the necessity for a user to purchase a specific gutter body 10, or for the manufacturer to make such. As is shown in figure 1, the end piece 47 is formed in a similar manner to each of the coupling means 40, with the difference being that the plate member is complete and blocks off the end of the channel 13. Provided on one face of the end piece 47 is a slot 33 for accepting the connecting means 30, and flange 32 and possible clip 31 thereof, at the end of the gutter body 10. That is, the end piece 47 interacts with the gutter body 10 in the same manner as each of the other coupling means 40, 45, 46 discussed above, but instead of providing the means for connecting two gutter bodies 10 together, the channel 13 end is blocked off instead. Once again, as disclosed above for the coupling means 40, 45, 46 there may be provided an integral sealing element 43 to give a water tight seal, furthermore a gap may be left between the end piece 47 and the end of the gutter body 10 for inclusion of an additional sealant compound, in the same manner as described above.

[0047] Each of the gutter bodies 10 shown in figures 1 to 3, are of the same length. This is a specific feature which improves the ease of manufacture of the gutter bodies 10 and also allows for improved integration at the point of use, as each piece has similar dimensions. On occasion, however, it is necessary to use sections of gutter body 10 which are shorter than the standard length. To this end, the gutter bodies 10 may be provided with one or a plurality of longitudinal partitioning sections 50 at positions along their length, for allowing sub-division of the body 10 into shorter lengths. One such example is seen in figure 1, and is positioned in the centre of the gutter body 10; although it is to be understood that each gutter body 10 in figure 3, may also comprise one or a plurality of such partitioning sections 50. Whilst the figure shows a gutter body 10 with just one partitioning section 50, it is clear that any number may be provided on the bodies 10 during manufacture, so as to allow the bodies 10 to have the most flexibility in their usage.

[0048] Specifically, the partitioning sections 50 are designed so that if the gutter body 10 is divided at one such point, the newly exposed ends of the body 10 are identical to the normal ends of the body 10. That is, the partitioning sections 50 have two connecting means 30 next to each other, i.e. two sets of flanges 32 and possibly clips 31, positioned side by side along the longitudinal direction of the body 10. In use, the gutter body 10 is broken between these two connecting means 30, such that each open end can be immediately attached to further gutter bodies 10 via coupling means 40 as disclosed above. It is anticipated, that the partitioning means 50 would be positioned at standard points along the length of each of the gutter bodies 10, so that standard sizes can be obtained when forming a drainage gutter system.

[0049] As has been described above, all of the different sections of gutter body 10 may be connected together via the coupling means 40, 45, 46 to form channels 13 of virtually any length. At times, however, it is necessary to provide a drainage system wherein channels 13 branch off or abut at an angle to each other. Figure 5,

shows two gutter bodies 10 which are connected perpendicularly to each other. In this situation, the end of one of the gutter bodies 10 is interfaced with a diagonal connecting means 60 situated on the outside of the second gutter body 10. The diagonal connecting means 60, are provided by an extension 63 running at an angle to the channel 13 of the gutter body 10 which has the same dimensions as the channel 13 of the gutter body 10. This extends from an outer surface of the gutter body 10 to present a similar structure as the connecting means 30. As such, the gutter bodies 10 can couple through the coupling means 40 in the same way as is described above, and are provided with the same flange 32 and possible clip 31 structure as the normal connecting means 30. In light of this, further discussion of the specifics of the connection need not be presented, instead reference is made to the details above.

[0050] It is clearly possible to provide gutter bodies 10, which have any number of diagonal connecting means 60 at any position along the length of the gutter body 10, and also on both sides. Indeed, the position shown in figure 5 is only by way of example. Furthermore, the gutter bodies 10 could be manufactured such that the diagonal connecting means 60 already have the necessary hole leading from the outside to the inside of the gutter body 10, to allow for the drainage of liquid. It is a preferred design, however, to provide the diagonal connecting means 60 on each manufactured gutter body 10 but without the hole leading through to the inside of the body 10. Again, this allows for fewer different gutter body 10 designs to be manufactured and purchased, thereby improving the usability of the system. This can be seen most clearly in figure 2, wherein the diagonal connecting means 60 are provided on the outside of the gutter body 10, and a wall section 61 is present sealing the inside of the gutter body 10. This wall section 61 forms an integral part of the channel 13 in the gutter body 10. When it is required to connect channels 13 together through the diagonal connecting means 60, the wall section 61 can be broken through to create the necessary hole which has the appropriate size for proper integration with the channels 13. Also, of course, two gutter bodies could be connected together through their diagonal connecting means 60, depending upon requirements.

[0051] Whilst the simple coupling means 40 is shown in figure 5 between the abutting gutter bodies 10, the further coupling means 45, 45 as disclosed above can equally well be utilised. That is, gutter bodies 10 of different height, width, relative height position and so forth, can be attached together via the diagonal connecting means 60 in exactly the same manner as disclosed above for connection of gutter bodies 10 in a straight line.

[0052] Whilst the figures all show the diagonal connecting means 60, being designed to allow perpendicular connection between gutter bodies 10, this is by way of example only. If so required, the diagonal connecting means 60 could be provided to allow a connection at any angle. For ease of manufacture, however, it is considered that 90° is the most appropriate angle for forming the diagonal connecting means 60. Should gutter bodies 10 require connection at angles other than 90°, it is possible to achieve this through angled coupling means. In the same manner as is disclosed above, these angled coupling means couple with the connecting means 30 and/or diagonal connecting means 60 in exactly the same manner as the straight and stepped coupling means 40, 45, 46. Again, no further discussion is presented as to this. The angled coupling means, may be provided with any angle between each of the slots 33 for attachment and integration with the connecting means 30 and diagonal connecting means 60.

[0053] A further possible feature of the diagonal coupling means 60, is a support 62 for the integration of a covering grate or the like. As has been discussed above, the gutter bodies 10 are provided with edging elements 12 which are utilised for fixing or resting the cover grates atop the gutter bodies 10. In order that there are no gaps left between cover grates when the gutter bodies 10 abut through the use of the diagonal connecting means 60, the support 62 is provided to allow the cover to fully integrate. As can best be seen in figure 6, the support 62 is a simple shelf like structure positioned between the two lateral sides of the diagonal connecting means 60. Additionally, this support runs along the top surface of the wall section 61 which is removed when gutter bodies 10 are connected through the diagonal connecting means 60. As such, it is intended that the wall section 61 will be removable such that it opens a hole which is surrounded by the diagonal connecting means 60 and the support 62.

[0054] Eventually, the liquid flowing through the channels 13 must be brought somewhere for final removal. In the case that the gutter system is being used for removal of water, for example from the sides of roads or paths and the like, it is possible for the channels 13 to lead and drain into a river or stream. Obviously, not all drainage systems will be positioned conveniently near such natural means, and so for most usage a further system is required. This could be in the form of a sump or drain adapter 70 which may be positioned in the lower surface of a channel 13 in a gutter body section 10. Such an adapter 70 can be seen interfacing with a gutter body 10 in figures 6a & 6b, with figure 7 showing just the adapter 70 in detail.

[0055] As can best be seen in figure 6b, the gutter body 10 may be provided with one or a plurality of drain connections 71 for interfacing the gutter body 10 with an underlying drain. Obviously, this drain could already be present, or could be further part of the drainage system being installed. In the figures, for clarity only one drain adapter 70 is shown, and further this is of only one size. Clearly, it is possible to provide multiple drain connections 71 and adapters 70 on one gutter body 10, and further it is to be understood that the adapters 70 can be provided for interfacing with the variety of gutter body widths as discussed previously. Finally, whilst the adapter 70 is shown with a simple round connector for inter-

facing with a drain, it is clear that any shape and size may be provided, depending upon existing pipelines of drainage systems in place, and the requirements for connection thereto.

[0056] The drain connection 71 is provided on the underside of the gutter bodies 10, and is fashioned to provide a short channel 75 directed downward. The sides of the connection 71 extend from the underside of the gutter body 10, and are the same length as the supporting means 20. As such, when the drain connection 71 is not being interfaced with a drain adapter 70, the lower edge of the connection 71 will rest upon the surface underlying the gutter body 10 and provide a further means of support.

[0057] In the same manner as the diagonal projecting means 60, the upper end of the drain connection 71 may be closed off by means of a break through section 72. This break through section 72, if provided, is anticipated as being of the same dimensions as the drain connection 71, and is for keeping the channel of the gutter body 10 intact when no connection to a drain is required. Obviously, gutter bodies 10 may be manufactured with preformed holes through to the drain connection 71. For ease of manufacture and use, however, it is anticipated that the gutter body 10 will be formed with the channel intact, and the break through section 72 provided.

[0058] As can be seen in figures 6 & 7, the drain adapter 70 is shaped and sized such that its top edge 76 will fit fully over the end of the drain connection 71. It is possible to provide a lip 77 on the upper edge of the adapter 70 which would fit exactly the inner open surface of the drain connection 71 and thereby secure the adapter 70 in the correct place. Furthermore, to ensure a water tight seal with the gutter body 10, the interfacing portion of the adapter 70 may be provided with a sealing means 73 in the form of a sealant strip, in the same manner as the connecting means 40 discussed above. This deformable strip, would be positioned to be pressed in the gap between the drain connection 71 and the adapter 70.

[0059] Whilst it is possible to simply position the gutter body 10 over the drain adapter 70 and hold this in place by either gravity, or the material filling the sides by the body 10 and the trench, it is preferable to fasten the sections together. To this end, the drain adapter 70 may be provided with some form of clipping mechanism which is designed to clip over an edge provided on the underside edge of the drain connection channel. A further possible mechanism, is shown best in figures 6b & 7. The adapter 70 is shown possessed of hooking connectors 74 which are placed just below the top of the adapter 70. These hooks are designed to interface with appropriate eyelets formed on the underside surface of the gutter body 10. Pushing the adapter 70 for engagement with the drain adapter 71 will cause the hooking connectors 74 to engage with these eyelets, and thereby firmly, and yet removably, hold the adapter 70 in place. A further possible method, which is shown in figure 6b, would be to position the hooking connectors 74 in such a position that they can utilise the flat surface section 22 formed between the lower edges 21 of adjacent supporting elements 20. This improves the ease of manufacture of the gutter body 10. Once again, in this manner the adapter 70 is simply clipped into position to form a removably held drain adapter 70. With this hooking mechanism, it is possible that the seal between the gutter body 10 and the adapter 70 would be sufficiently good to provide water-tightness. Obviously, however, the sealant means 73 as discussed above could also be employed.

[0060] As has been discussed above, the gutter body 10 is preferably formed with numerous possible connections provided, with these preferably closed off for when simple usage of the body 10 as a channel is required. The break through sections 61, 72, and longitudinal partitioning sections 50, may be formed in such a manner that the material at the edges and between such sections is thinner to allow the simple breaking of the channel with force. Preferably, however, these sections are provided such that either a knife, saw or other cutting means is required to form the holes or separate the gutter body 10 lengths, this does not weaken the gutter bodies 10. As the means are all provided, this allows for precise and accurate separation or breaking through, without any chance for misalignment.

[0061] It is intended, that each of the above elements can be readily manufactured, preferably by moulding of a plastic. That is, the individual elements of the gutter body 10, incorporating the connecting means 30, supporting elements 20 and the like are preferably formed as a single moulded piece. The same is true of the plurality of the connecting means 40, 45, 46, 47 discussed above, as well as the drain adapters 70. Preferably also, the plastic is one of a thermoplastic. Clearly, however, the gutter bodies 10 and other elements, could be formed from separate elements and connected together, should the necessity arise, or a specific design of system be required.

[0062] Finally, the discussion above has centred on the use of the elements and sections, primarily for water removal, and in particular from the sides of roads or pathways. Obviously, many other uses exist for such a system, and these will be clear to the skilled person. Furthermore, as it is preferred that the system be made primarily from a plastic material, good chemical resistance can be conferred on to the channels, allowing them to be used for a variety of liquids.

[0063] While various features and embodiments of the invention are described above, they can readily be combined with each other resulting in further embodiments of the invention.

Claims

1. A drainage gutter system, in particular for surface water drainage with at least one gutter body (10) having on its upper edges (11) an edging element

(12) for supporting a covering grate or suchlike covering means and supporting elements (20) for supporting the gutter body on an underlying surface and connecting means (30) for the frontal connection of a plurality of further gutter bodies, gullies or similar water drainage means, and with coupling means (40) for connecting two gutter bodies (10) by means of the connecting means (30),
characterised in that
said coupling means (40) are formed to enclose the connecting means (30) from the outside and to seal the gutter bodies against each other and/or to support thereby that the coupling means (40) have bearing means (41) on their under faces (42) which are dimensioned such that after connection of a coupling means (40) with at least one gutter body (10) the bearing means (41) are in alignment with the supporting elements (20) of the gutter body (10).

2. The drainage gutter system according to claim 1,
characterised in that
the gutter bodies (10) on their outer faces have projecting diagonal connecting means (60) for branched-off connection with other gutter bodies (10).

3. The drainage gutter system according to claim 2,
characterised in that
the diagonal connecting means (60) include wall sections (61) which can be broken through of the gutter bodies (10).

4. The drainage gutter system according to one of the preceding claims,
characterised in that
the gutter bodies (10) include longitudinal partitioning sections (50) for subdividing a gutter body (10) into shorter sections wherein abutting on the longitudinal partitioning sections (50) outwardly projecting connecting means are provided such that on the shorter sections via the coupling means (40) further gutter bodies or similar water drainage means can be joined.

5. The drainage gutter system according to claim 3,
characterised in that
said break-through wall sections (61) are provided under a support (62) for a grate or such covering.

6. The drainage gutter system according to one of the preceding claims,
characterised in that
the connecting means (30) and the coupling means (40) have such fixing means that they can be attached together in snap-in/snap-on engagement.

7. The drainage gutter system according to one of the preceding claims,
characterised in that
the coupling means (40) have sealing elements (43), in particular, elastomer strips or similar sealants which can be brought into contact with connecting means (30).

8. The drainage gutter system according to one of the preceding claims,
characterised in that
the coupling means (40) include plate elements which are formed to connect gutter bodies of different heights on their two surfaces.

9. The drainage gutter system according to one of the preceding claims,
characterised in that
the coupling means (40) include plate elements which are formed to be closed to form a gutter end (47).

10. The drainage gutter system according to one of the preceding claims,
characterised in that
the coupling elements (40) are dimensioned such that with the connection of two gutter elements (10) through a coupling element (40) between the end faces of the gutter body (10) a gap (23) remains which can be injected with an elastic sealing material.

11. The drainage gutter system according to one of the preceding claims,
characterised in that
the supporting elements (20) are formed with a spacing towards the gutter body.

12. The drainage gutter system according to one of the preceding claims,
characterised in that
the supporting elements are formed substantially perpendicular from the edging elements (12) downwards through formation of lateral reinforcements of the gutter body (10).

13. The drainage gutter system according to one of the preceding claims,
characterised in that
the at least one drain connection (71) is formed at the underside of the gutter body (10) such that an adapter (70) can be used for connection to a pipeline from below.

14. The drainage gutter system according to one of the preceding claims, in particular claim 13,
characterised in that
the drain connection (71) on its upper side is closed by a break-through section (72) of the gutter body (10).

15. The drainage gutter system according to one of the preceding claims, in particular, claims 13 or 14, **characterised in that** the adapter (70) has sealing means (73) for sealed fastening to the drain connections (71).

16. The drainage gutter system according to one of the preceding claims, in particular, according to one of the claims 13 to 15, **characterised in that** the adapter (70) has connecting means, preferably hooking connections (74) which can be snapped in for tool-free, sealant-free connection with the gutter body.

17. The drainage gutter system according to one of the preceding claims, **characterised in that** the gutter body (10) is moulded from plastic, preferably from a thermoplastic plastic.

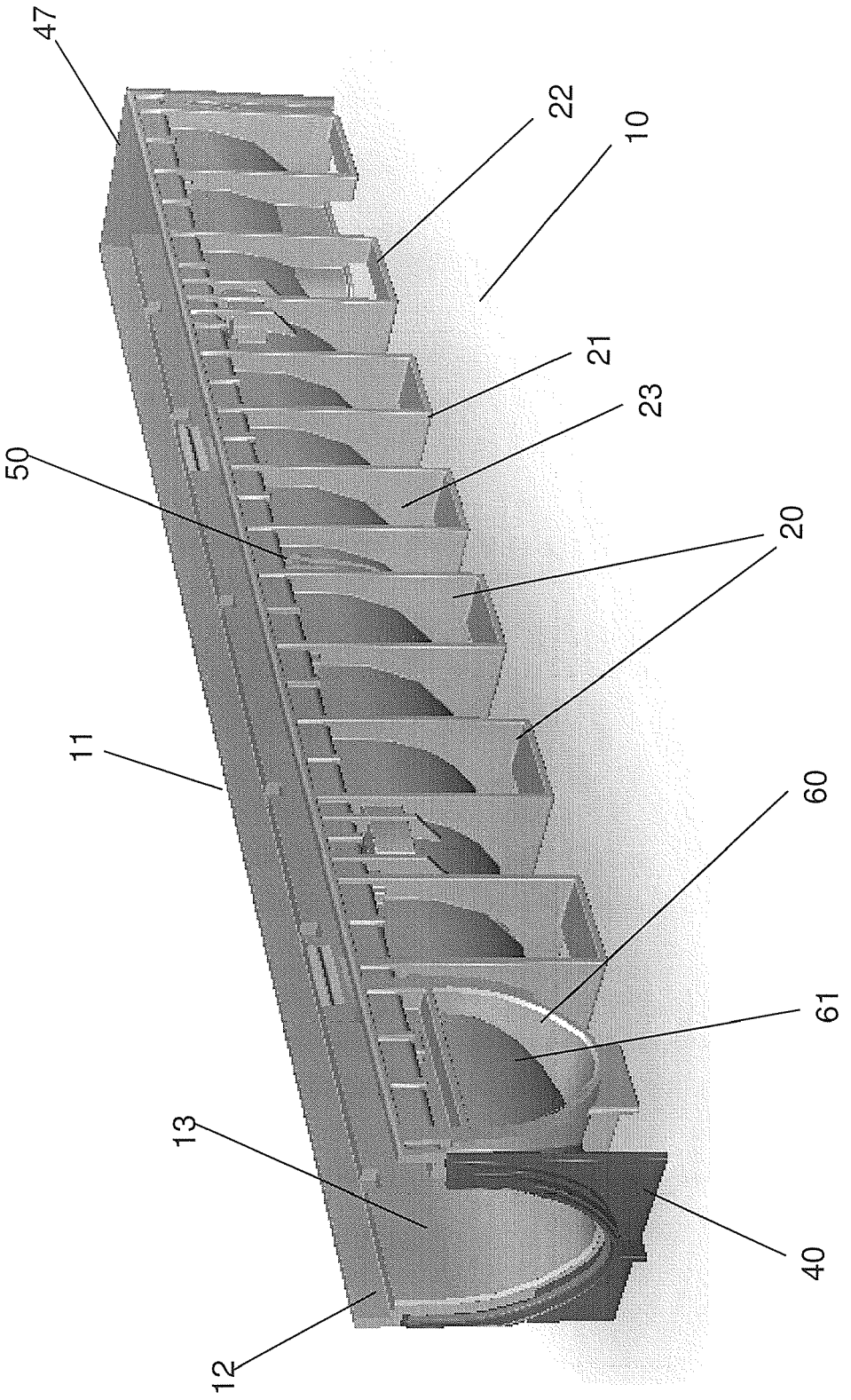


Figure 1

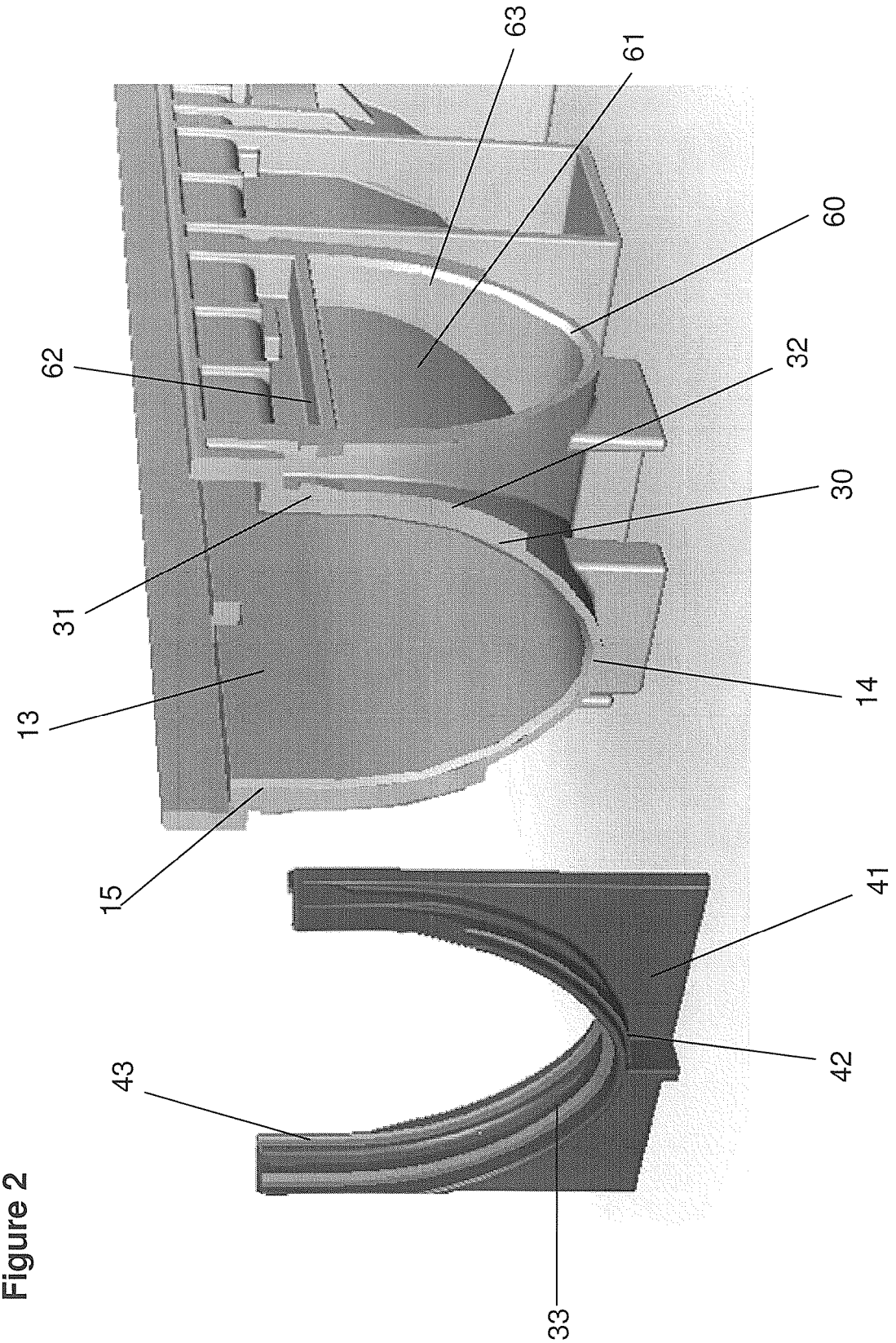


Figure 2

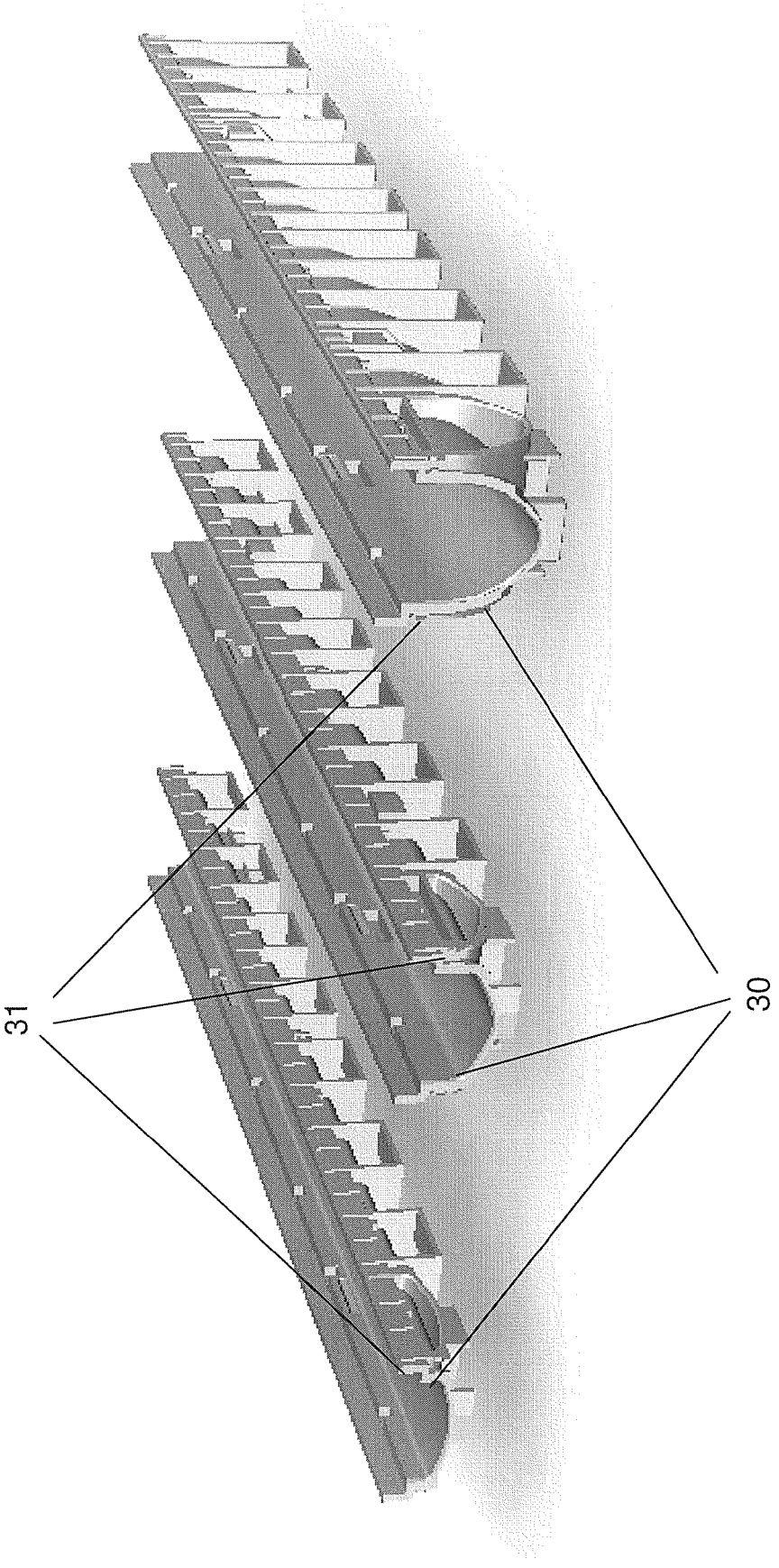


Figure 3

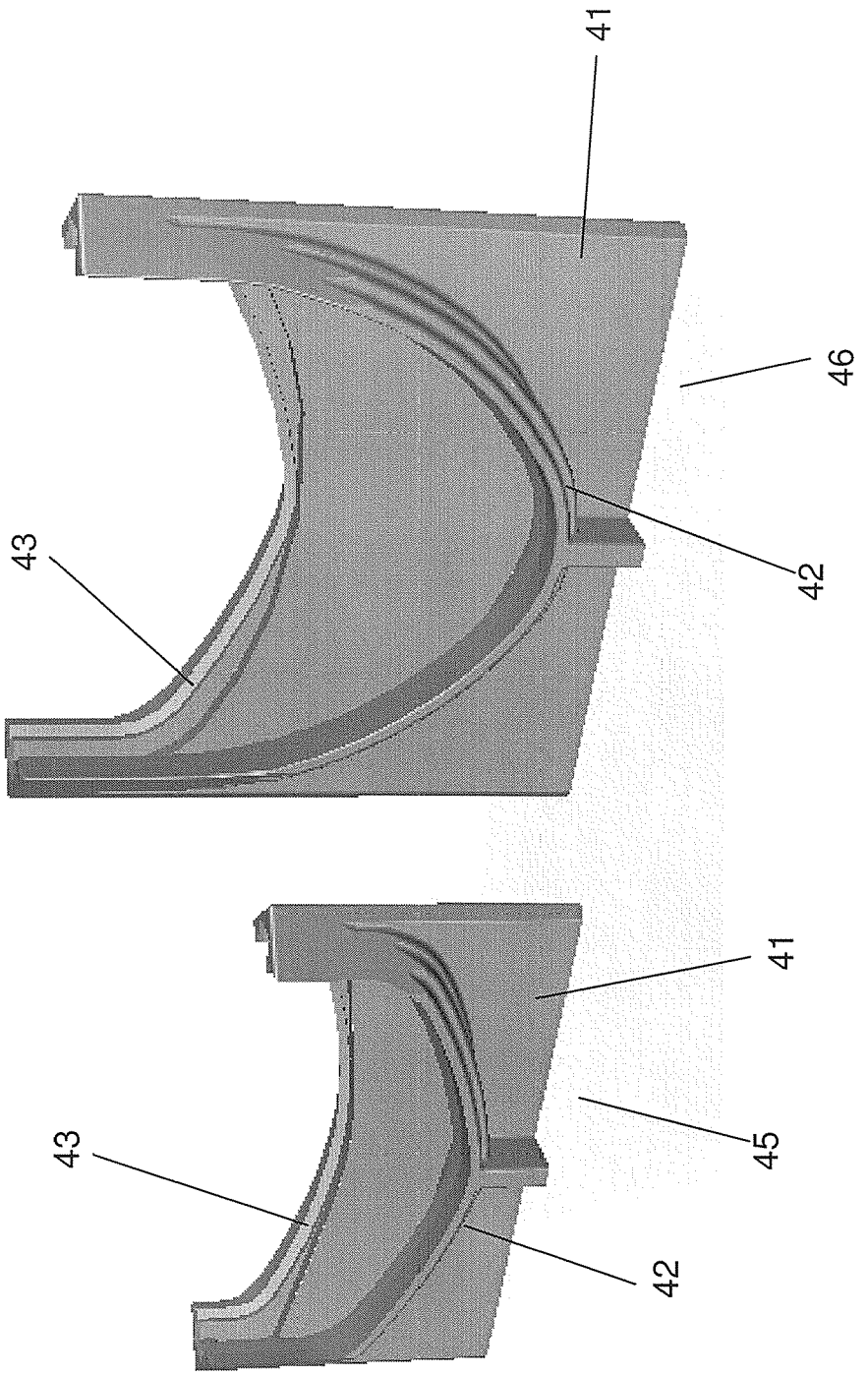


Figure 4

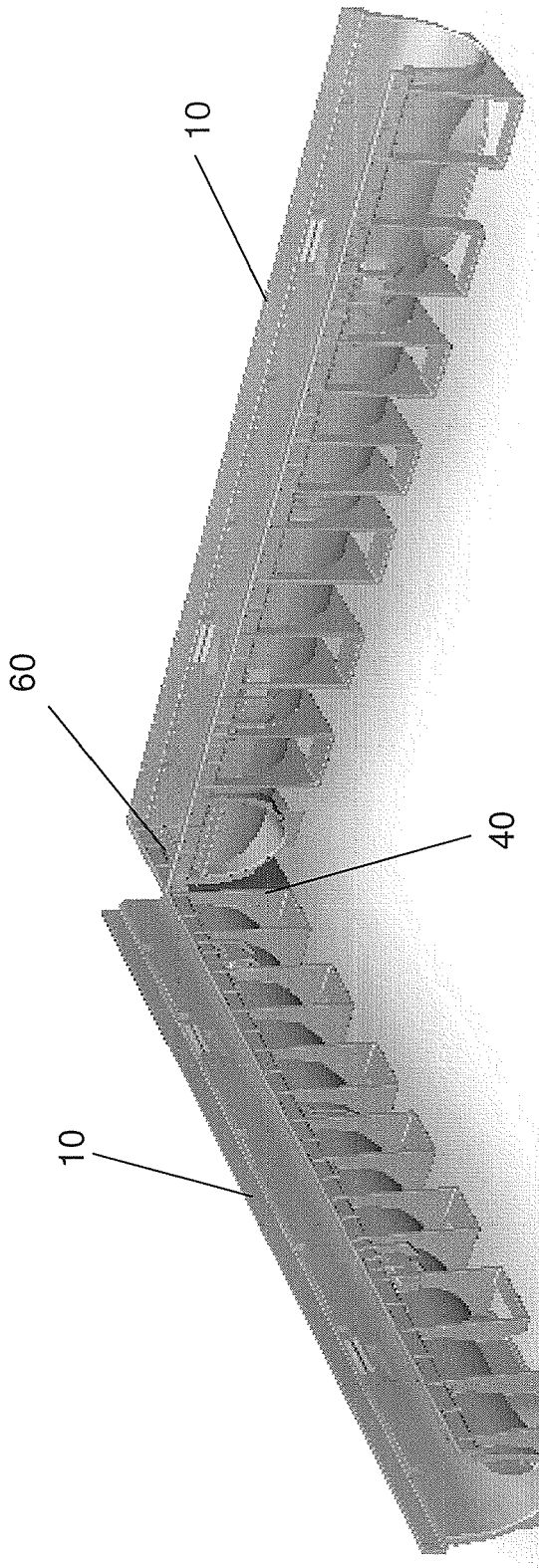


Figure 5

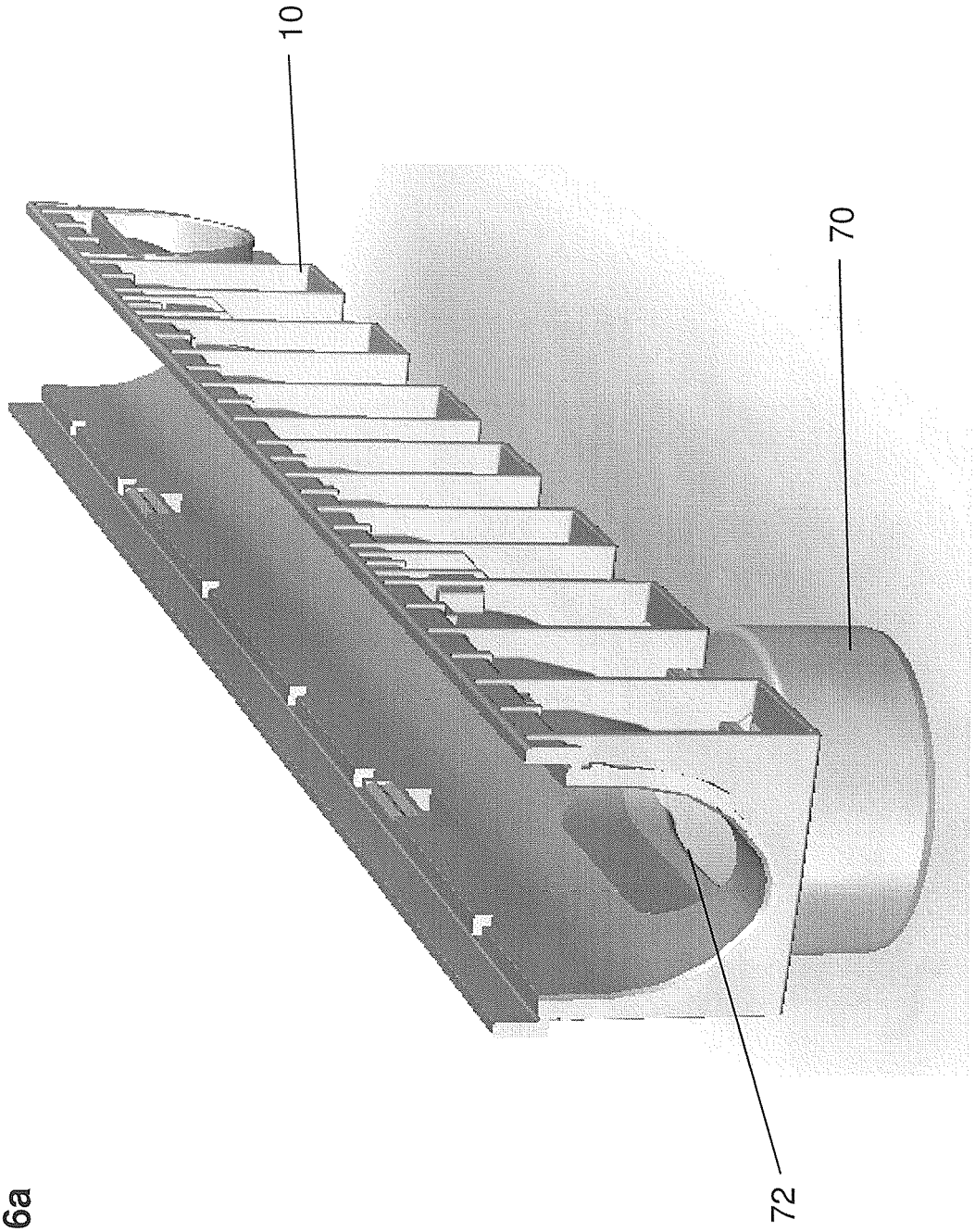


Figure 6a

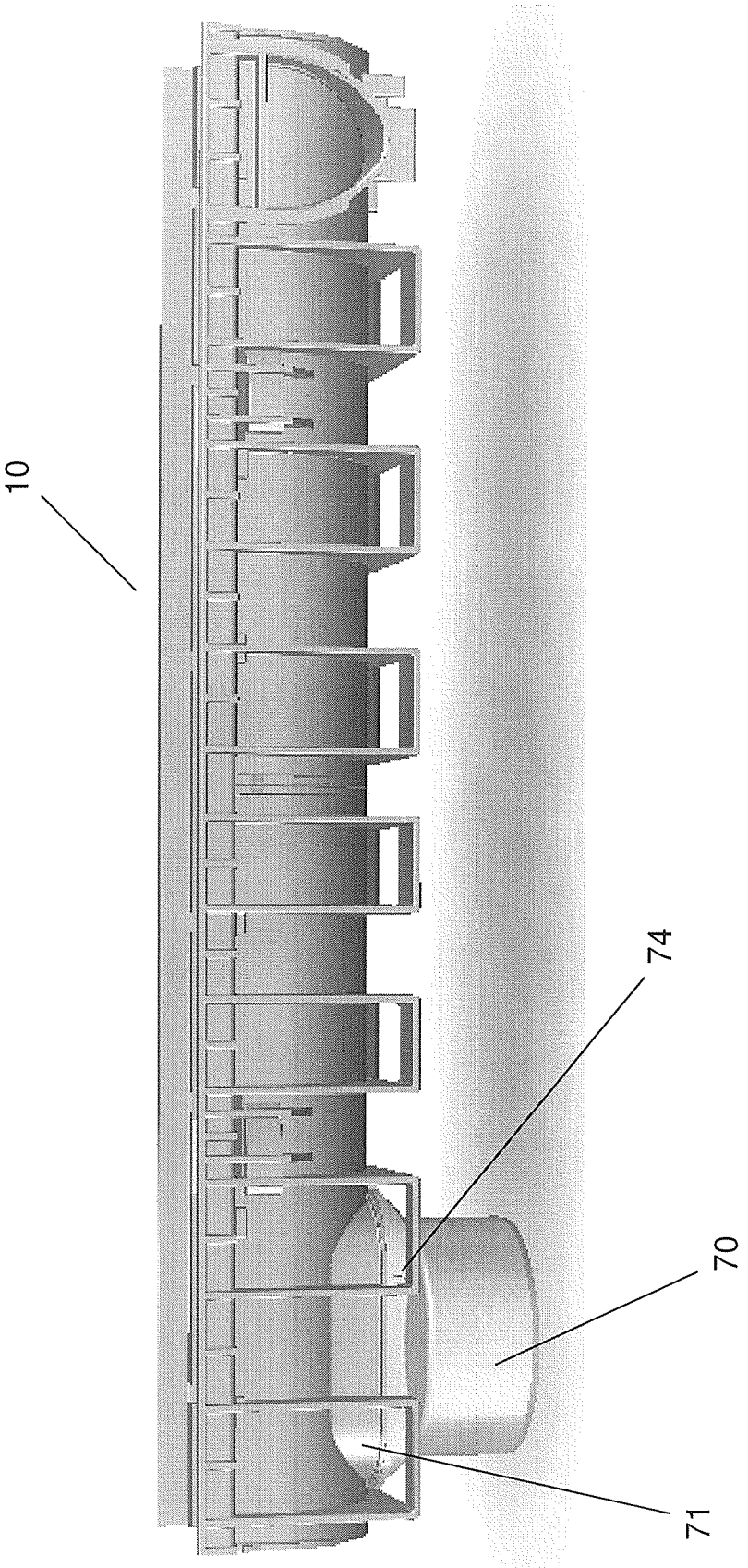


Figure 6b

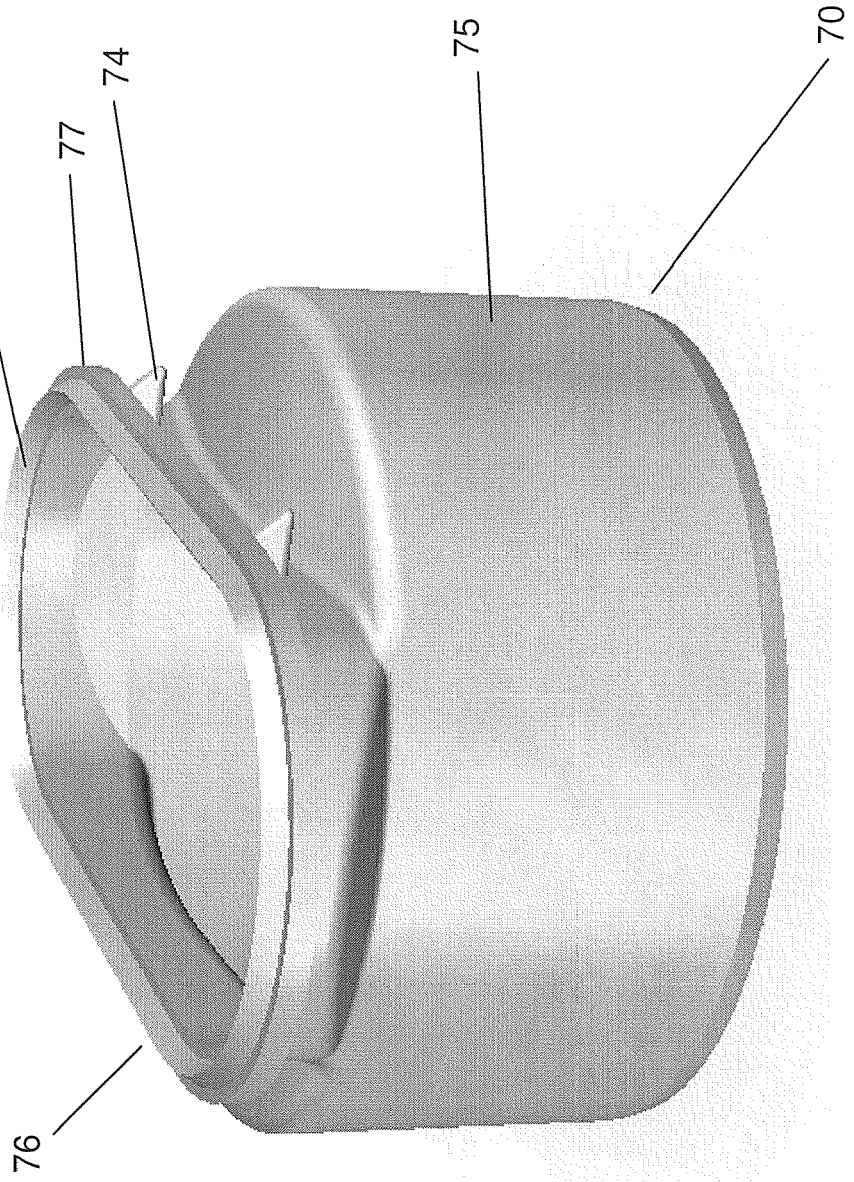


Figure 7

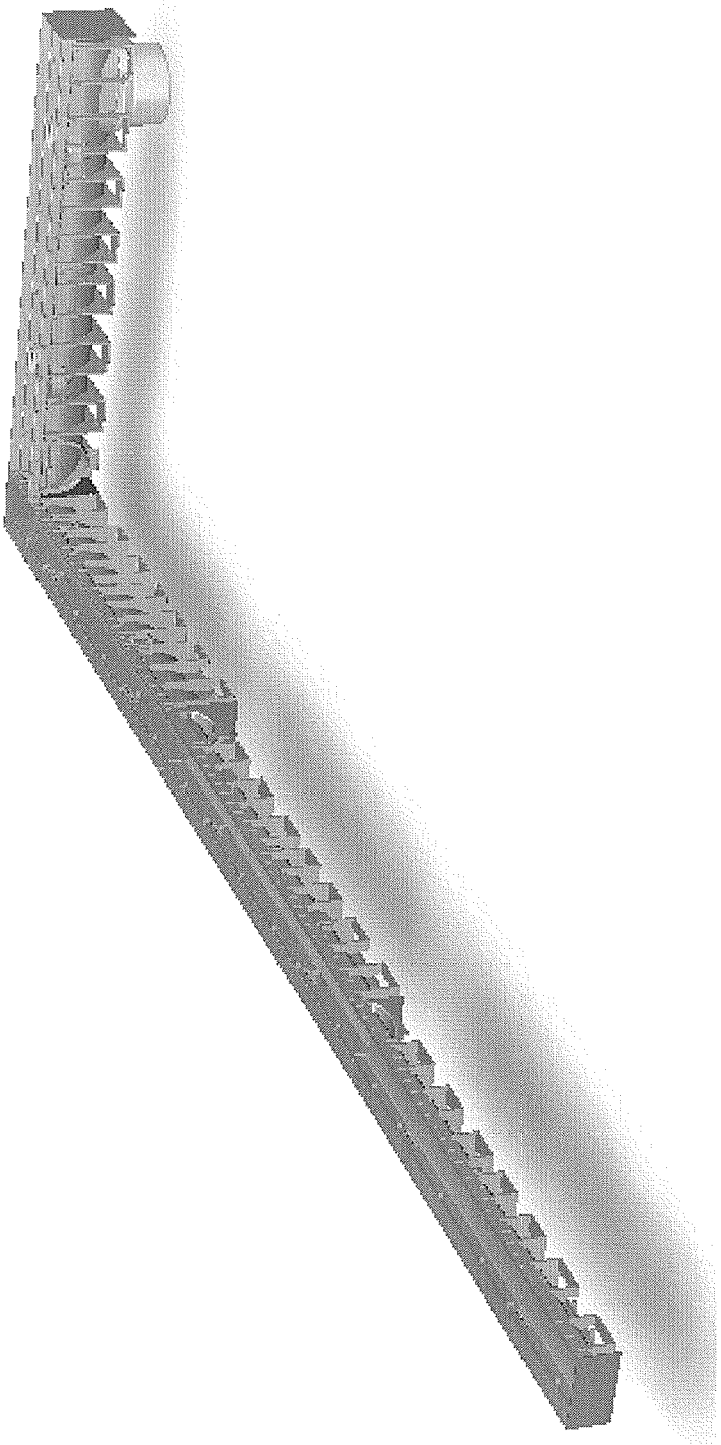


Figure 8

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 06 11 7558

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	FR 2 791 714 A1 (NICOLL RACCORDS PLASTIQUES [FR]) 6 October 2000 (2000-10-06) * figures 1,3-5 * * claim 1 * * page 6, line 4 - line 6 *	1-3,6,7, 9,11-15, 17	INV. E03F3/04 E01C11/22
A	EP 1 524 373 A (DAKOTA METAL PLASTIC WORKS LLC [US]) 20 April 2005 (2005-04-20) * figures 1-5,2a *	1,3,9, 12-15	
A	US 6 027 283 A (SCHWEINBERG F MATTHEW [US] ET AL) 22 February 2000 (2000-02-22) * figures 2,3-6a *	1	
A	US 2006/013649 A1 (HUMPHRIES DEREK [US] ET AL) 19 January 2006 (2006-01-19) * figure 1 *	1	

TECHNICAL FIELDS SEARCHED (IPC)

E03F
E01C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	1 December 2006	Flygare, Esa

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 06 11 7558

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01-12-2006

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EP 1524373 A	20-04-2005	NONE	
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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