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(71) Applicant: **Janssen, Bob**
7701 SG Dedemsvaart (NL)

(72) Inventor: **Kooistra, Erik Hans**
7701 SG Dedemsvaart (NL)

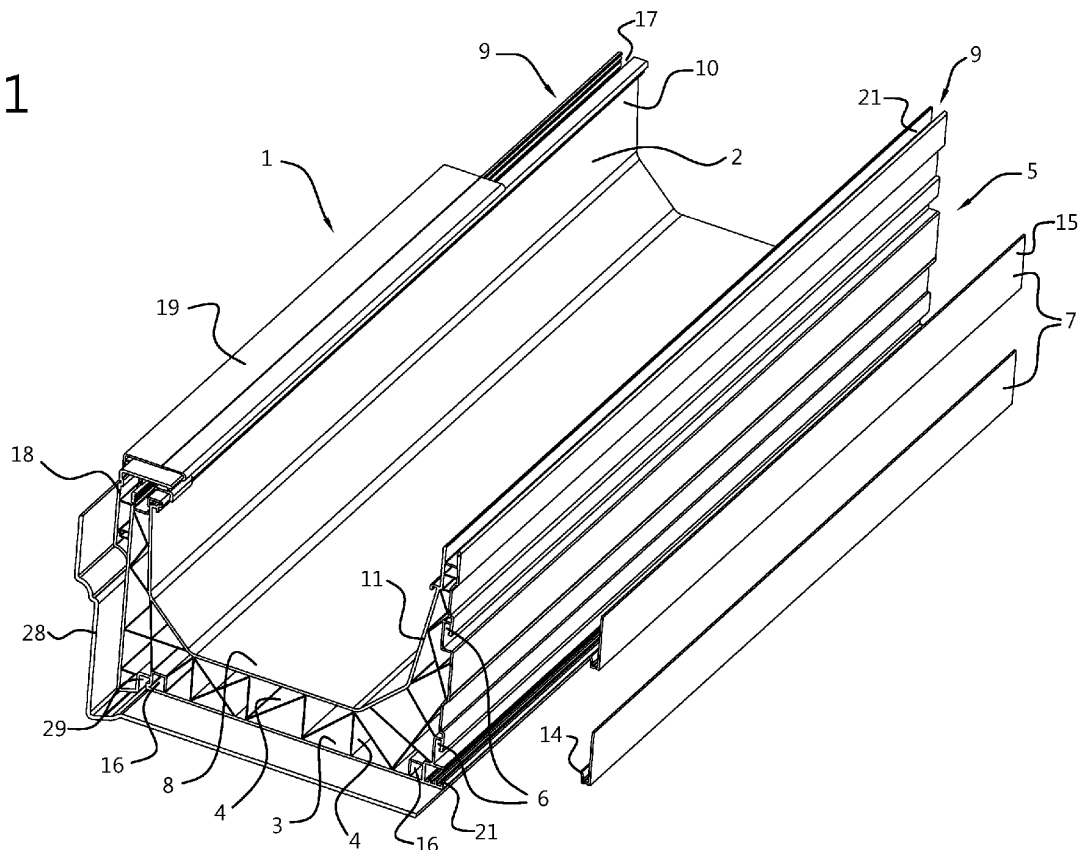
(74) Representative: **van Essen, Peter Augustinus**
Van Essen Patent B.V.
Agro Business Park 50
6708 PW Wageningen (NL)

(54) **GUTTER**

(57) The invention provides a gutter assembly, comprising a gutter which is double walled, and comprises an inner and an outer wall and ribs connecting said inner and outer wall, providing a functionally self supporting gutter, the gutter assembly further comprising:

- an attachment rail extending along a length and at a building side outer wall part of the gutter;
- a mounting rail comprising a mounting ledge fitting said gutter rail and comprising an attachment end for attaching said mounting rail to a building.

Fig. 1



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Description

Field of the invention

[0001] The invention relates to an extruded or through additive manufacturing produced gutter.

Background of the invention

[0002] Gutters have been known almost as long as people make buildings and houses. Known gutters mostly connect to roofs. These gutters were made from wood, ceramic, and even from tin (pewter) or copper. In the last 50 years, gutters made from polymer material have been introduced. Most of these gutters were single walled, requiring much coupling support. Examples of these gutters are in EP869230.

[0003] NL194090 introduced one of the first self-supporting gutters from synthetic material or polymer, in that case from PVC (polyvinylchloride). In the abstract, it was introduced as "Polyester gutter element for a bracketless corner gutter of a sloping roof, comprising an elongate strip for positioning and attaching the gutter element to a top surface of the lower area of the eaves, and a front upstand, which is essentially perpendicular to the positioning strip, and a rear upstand, which projects at an angle downwards from the positioning strip, as well as a bottom wall, which together with the front upstand defines a substantially V-shaped flow profile, the rear upstand being provided with a supporting or bearing surface which perpendicularly adjoins the positioning strip, in order to provide support against the end side of the bottom edge of the roof. The gutter element is hollow-walled and is provided with double walls which are connected to one another by longitudinal partitions, which at least locally form a framework structure."

[0004] The gutter that was introduced at that time lacked flexibility in design and use.

Summary of the invention

[0005] A disadvantage of prior art is that most gutters from synthetic material lack functionality and can not be applied on many known buildings.

[0006] Hence, it is an aspect of the invention to provide an alternative gutter, gutter system and method for providing a gutter, which preferably further at least partly obviates one or more of above-described drawbacks.

[0007] There is provide a gutter assembly, comprising a gutter which is double walled, and comprises an inner and an outer wall and ribs connecting said inner and outer wall, providing a functionally self supporting gutter, the gutter assembly further comprising:

- an attachment rail extending along a length and at a building side outer wall part of the gutter;
- a mounting rail comprising a mounting ledge fitting said gutter rail and comprising an attachment end

for attaching said mounting rail to a building.

[0008] In particular, the mounting rail allows a sliding degree of motion of the gutter with respect to the mounting rail and thus a building in the longitudinal direction of the gutter.

[0009] The gutter is produced in lengths of up to 8 meters. Such a length can easily be transported to a site of use. Usually, a gutter of this type will be produced in an extrusion process. This type of process is well known and results in a double walled, self supporting gutter. Attachment of such a gutter can be simplified and swifter. Furthermore, the attachment allows gutter ends to slide when mounted. This makes the mounting able to handle dynamic situations, like working of building parts, temperature changes, and the like.

[0010] Furthermore, the production allows for incorporating additional features like additional rails, or other coupling means that allows attachment or coupling of further parts like lists, aesthetic profiles, reinforcement parts, braces.

[0011] The current gutter is also referred to as synthetic material gutter or plastic gutter. The gutter can in particular be made of synthetic material that can be extruded. In order to make the gutter better weathering resistant, the synthetic gutter can be made of polyvinylchloride (PVC).

[0012] In an embodiment, the gutter is produced by additive manufacturing. This is also referred to as "3D printing". In this method, each time a new layer is added, thus producing a length of gutter.

[0013] In an embodiment, Dependent claims attachment rail comprises a mounting recess in said outer wall part, and said mounting rail comprising a mounting ledge fitting said attachment rail.

[0014] In an embodiment, the mounting recess comprised an undercut groove, and said mounting rail comprises a U-shaped edge fitting, in particular snap-fitting, into said undercut groove of said mounting recess.

[0015] In an embodiment, the inner gutter wall comprises a gutter bottom, a building side inner wall extending from said gutter bottom and an opposite outer side inner wall extending from said gutter bottom, and said gutter comprising an building side gutter edge and an opposite outer gutter edge.

[0016] In an embodiment, the gutter assembly further comprising a gutter coupling assembly for coupling two gutters with their ends for providing a continuous gutter.

[0017] In an embodiment, the gutter coupling assembly comprises:

- a first gutter coupling part comprising a gutter attaching end for attaching to said end of one of said two gutters, and a first closing flange, and
- a second gutter coupling part comprising a gutter attachment end for attaching to said end of the other of said two gutters, and gutter coupling sealing flange complementary with said first closing flange to pro-

vide a water tight coupling.

[0018] In an embodiment, said first gutter coupling part comprising a gutter attaching end for attaching to said end of one of said two gutters, and a first coupling flange.

[0019] In an embodiment, said second gutter coupling part comprising a gutter attachment end for attaching to said end of the other of said two gutters, and gutter coupling sealing flange shaped for in operation allowing said first coupling flange to slide over said gutter coupling sealing flange.

[0020] In an embodiment, the gutter attachment end of said first and said second gutter coupling part each comprise a coupling plate substantially matching a cross section of said gutter, for attaching, in particular fixing, to a gutter end, for instance fixing using adhesive.

[0021] In an embodiment, the gutter attachment end further comprises a gutter coupling attachment flange comprising an outer surface matching an inner surface of the gutter for allowing coupling, in an embodiment attaching, the gutter coupling attachment flange and said inner surface of the gutter.

[0022] In an embodiment, the coupling flange has a gutter side, and said second sealing flange has a sealing surface which sealing surface and gutter side are sealingly flush with an inner surface of the gutter attachment flange.

[0023] In an embodiment, the gutter is produced in a process selected from extrusion and additive manufacturing, and which is substantially from a polymer material, preferably from PVC.

[0024] In an embodiment, the gutter assembly further comprises a water sensor for providing a warning signal in case of gutter clogging.

[0025] In an embodiment, the water sensor comprises a sensing element for detecting a water level in said gutter, in an embodiment extending into said gutter up to a predefined height above a gutter lower inner wall for detecting water above a predefined water height level (wh) in said gutter.

[0026] In an embodiment, the water sensor further comprises an attachment part for attaching, in particular snapping, said water sensor onto said gutter.

[0027] In an embodiment, the water sensor comprises a power supply, in particular a photovoltaic element (101), for providing operational electrical power to said water sensor.

[0028] In an embodiment, the water sensor comprises a wireless transmitter for transmitting a signal when a water level is detected.

[0029] There is further provided a water sensor for determining a water level in a gutter, said water sensor comprising:

- an attachment end for attaching said water sensor on a gutter;
- a power source;
- a water detector coupled to said attachment end for

detecting a predefined water level in a gutter once attached to said gutter;

- a wireless transmitter, and
- a processor for running a computer program.

[0030] In an embodiment, the computer program when receiving a first signal from the water detector, and when receiving a further signal from said water detector at a predetermined time from said first signal, issues a gutter clogged signal via said wireless transmitter. In an embodiment, said gutter clogged signal is issued after receiving several signals from said water detector at predetermined time intervals.

[0031] There is further provided a coupling assembly for coupling ends of gutter together allowing water to flow between the ends of gutter, wherein said gutter attachment end of said first and said second gutter coupling part each comprise a coupling plate substantially matching a cross section of said gutter, for attaching, in particular fixing, to a gutter end, for instance fixing using adhesive.

[0032] The terms "upstream" and "downstream" relate to an arrangement of items or features relative to the flow of water from a source position to a drain position. For instance, in the gutter water flows from an upstream end to a downstream end.

[0033] The term "substantially" herein, such as in "substantially rectangular" or in "substantially consists", will be understood by the person skilled in the art. The term "substantially" may also include embodiments with "entirely", "completely", "all", etc. Hence, in embodiments the adjective substantially may also be removed. Where applicable, the term "substantially" may also relate to 90% or higher, such as 95% or higher, especially 99% or higher, even more especially 99.5% or higher, including 100%. The term "comprise" includes also embodiments wherein the term "comprises" means "consists of".

[0034] The term "functionally" will be understood by, and be clear to, a person skilled in the art. The term "substantially" as well as "functionally" may also include embodiments with "entirely", "completely", "all", etc. Hence, in embodiments the adjective functionally may also be removed. When used, for instance in "functionally parallel", a skilled person will understand that the adjective "functionally" includes the term substantially as explained above. Functionally in particular is to be understood to include a configuration of features that allows these features to function as if the adjective "functionally" was not present. The term "functionally" is intended to cover variations in the feature to which it refers, and which variations are such that in the functional use of the feature, possibly in combination with other features it relates to in the invention, that combination of features is able to operate or function. For instance, if an antenna is functionally coupled or functionally connected to a communication device, received electromagnetic signals that are received by the antenna can be used by the communication device. The word "functionally" as for instance

used in "functionally parallel" is used to cover exactly parallel, but also the embodiments that are covered by the word "substantially" explained above. For instance, "functionally parallel" relates to embodiments that in operation function as if the parts are for instance parallel. This covers embodiments for which it is clear to a skilled person that it operates within its intended field of use as if it were parallel.

[0035] Furthermore, the terms first, second, third and the like in the description and in the claims, are used for distinguishing between similar elements and not necessarily for describing a sequential or chronological order. It is to be understood that the terms so used are interchangeable under appropriate circumstances and that the embodiments of the invention described herein are capable of operation in other sequences than described or illustrated herein.

[0036] The devices or apparatus herein are amongst others described during operation. As will be clear to the person skilled in the art, the invention is not limited to methods of operation or devices in operation.

[0037] It should be noted that the above-mentioned embodiments illustrate rather than limit the invention, and that those skilled in the art will be able to design many alternative embodiments without departing from the scope of the appended claims. In the claims, any reference signs placed between parentheses shall not be construed as limiting the claim. Use of the verb "to comprise" and its conjugations does not exclude the presence of elements or steps other than those stated in a claim. The article "a" or "an" preceding an element does not exclude the presence of a plurality of such elements. The invention may be implemented by means of hardware comprising several distinct elements, and by means of a suitably programmed computer. In the device or apparatus claims enumerating several means, several of these means may be embodied by one and the same item of hardware. The mere fact that certain measures are recited in mutually different dependent claims does not indicate that a combination of these measures cannot be used to advantage.

[0038] The invention further applies to an apparatus or device comprising one or more of the characterising features described in the description and/or shown in the attached drawings. The invention further pertains to a method or process comprising one or more of the characterising features described in the description and/or shown in the attached drawings.

[0039] The various aspects discussed in this patent can be combined in order to provide additional advantages. Furthermore, some of the features can form the basis for one or more divisional applications.

Brief description of the drawings

[0040] Embodiments of the invention will now be described, by way of example only, with reference to the accompanying schematic drawings in which correspond-

ing reference symbols indicate corresponding parts, and in which:

Figure 1 schematically depicts a perspective view of a gutter;

Figure 2 shows an end view of the gutter of figure 1; Figure 3 a perspective view of a gutter with end part; Figure 4 the embodiment of figure 3 from opposite viewpoint;

Figure 5 a perspective view of a corner of a gutter, showing two gutter ends are coupled in a mitre joint; Figure 6 shows a corner gutter with a transport brace; Figure 7 shows a gutter while a reinforcement brace is being attached;

Figure 8 a perspective view of figure 7;

Figure 9 a cross sectional view of the gutter of figure 7 with attached reinforcement brace;

Figure 10 a perspective view of figure 9;

Figure 11 a perspective view of two gutter ends according to figure 1 with gutter coupling assembly, and Figure 12 the gutter of figure 1 with water sensor.

[0041] The drawings are not necessarily on scale

Description of preferred embodiments

[0042] Figure 1 schematically depicts a perspective view of a gutter 1, and figure 2 shows a side/en view. The gutter 1 is an extruded gutter or is manufactured using additive manufacturing, also referred to as 3D printing.

[0043] The gutter 1 is double walled, comprising an inner wall 2, and outer wall 3, and reinforcing ribs 4 connecting the inner wall 2 and outer wall 3. The inner wall 2 and outer wall 3 connect at opposite gutter edges 9. The gutter 1 is generally channel shaped and has a gutter bottom 8. The gutter 1 has a side that is in used mounted against or directed towards a building. This side is indicated with B, Building side. The opposite side is indicated O, outer side.

[0044] The gutter 1 is elongated or extends in longitudinal direction. Connected to and extending from the gutter bottom 8 are a building side inner wall 11 and an outer side inner wall 10. The building side inner wall 11, outer side inner wall 10, and gutter bottom 8 together define the channel shape for receiving water and guiding the received water away to a drain pipe.

[0045] The gutter 1 comprises several grooves, rails, recesses and flanges extending in longitudinal direction. These grooves, rails, flanges and recesses provide attachment, mounting and/or coupling parts for various other parts.

[0046] The gutter 1 has a building side outer wall 5. This building side outer wall 5 here comprises two parallel mounting recesses 6 providing gutter attachment rails. that in this embodiment provide a one-sided undercut groove 12. The undercutting 12 provides the mounting recess 6 with a gutter mounting flange 13. The gutter

mounting flange 13 extends in gutter bottom 8 direction.

[0047] The gutter 1 comprises in this embodiment two mounting strips 7, one for each mounting recess 6. Mounting strip 7 on one side has a U-shape side which provides the mounting strip 7 with a mounting strip/rail flange 14. The dimensions of the mounting recess 6, undercutting 12 and gutter mounting flange 13 on one side and the U-shape side and mounting strip flange 14 are mutually designed and dimensioned to provide a snap fit when mounting strip flange 14 is introduced into the undercutting 12 as depicted in figure 2. For better mounting and fixing, the mounting strip flange 14 extends away from the strip body. Thus, mounting rail flange 14 and mounting rail body 15 are not parallel. The angle is between 5 and 20 degrees. In particular between 10 and 20 degrees.

[0048] In an embodiment, the end of gutter mounting flange 13 is thickened in the direction of the building side inner wall 11. Furthermore, in this embodiment, the flaring out or extending of the mounting strip flange 14 starts about one third of its width. When the gutter mounting flange 13 enters the U-shaped side of the mounting strip, it pushes the flange a little away from the mounting strip 7 and against a wall of the mounting recess 6. This provides fixation.

[0049] In the illustrated embodiment, the mounting strip 7 runs along substantially the full length of the gutter 1. In this way, a secure and aligned mounting is ensured. It is also possible to use shorter ends of mounting strip 7, but in such instances, mutual alignment of these ends of mounting strip 7 is required. In the illustrated embodiment, the gutter 1 has two mounting recesses 6. This allows either more firm fixation, or can provide two different mounting options.

[0050] Using for instance a screw through the mounting strip/rail body 15, a mounting rail 7 can be attached or fixed to a building. If a screw head extends, it will fall in the additional recess above the mounting recess 6. The mounting rail 7 can be made from synthetic material. It may also be made from aluminium.

[0051] The gutter 1 comprises here two tubular profiles 16, here having a rectangular cross section. The tubular profiles 16 run along the length of a gutter. They can be used for receiving a coupling rod as illustrated in figure 5. Such a mounting rod can have a rectangular cross section, preferably matching the tubular profile 1 cross section. This can provide additional fixation of gutter parts. The outer side bottom wall 25, the inner side of it, provides one wall of the tubular profile 16. The tubular profiles 16 are provided at/near opposite lower corners of the gutter 1.

[0052] In the building side outer wall 5, the gutter 1 further comprises a plate groove 22. Plate groove 22 is provided for receiving an edge of a board or panel, for instance a board covering an overhang of a roof.

[0053] The gutter 1 further comprises an inner flange 23 extending inward and comprising an end bending towards the gutter bottom 8. This in fact provides an un-

dercut rail.

[0054] Gutter 1, or better the gutter edge 9 at the outer side of the gutter 1, is further provided with an outer side gutter edge groove 17.

[0055] The gutter edge 9 at the outer side of gutter 1 has various features that allow mounting/snapping of various decorative strips. These decorative strips and trims and rails are both decorative and functional. For instance a snap-fit cornice 18 is depicted in figure 1 and 2. A further snap fit cornice decorative strip 19 covers the top of the cornice 18. The embodiment of figures 1 and 2 can be provided with a gutter cladding profile 28 for covering a further attachment rail 29 and providing the gutter with a custom colour. The gutter cladding profile can further be provided with a colouring foil for allowing further custom colours. The snap fit cornice decorative strip 19 covers an edge of the gutter cladding profile 28, so as to fix it and clear its edge of sight..

[0056] The gutter 1 has a thickness of the inner wall 2 and outer wall 3 of 1-4 mm. In particular the thickness is 1.5-3 mm. The ribs 4 have a thickness of between 0.2-2 mm. In particular, the thickness of the ribs is 0.5-1.5 mm. It was found that this provides an optimal trade off between raw material used and strength. It allows single gutter lengths of 8 meters long. The recesses, profiles and flanges are functional for attaching parts, and provide additional strength and reinforcement.

[0057] Figures 3 and 4 show perspective views from opposite sides. Depicted is an gutter closing piece 30 that can be fitted to an end of the gutter 1 in order to close it. In the figures 3 and 4, furthermore a gutter coupling piece 20 is depicted, for coupling two ends of gutter butt-
ed together.

[0058] Gutter closing piece 30 comprises an end plate 31 matching the shape of the cross section of a gutter 1. A closing piece flange 32 extends from the end plate 31. The end plate 31 at the closing piece side in an embodiment is provided with adhesive, for instance resulting from an applied double sided tape end. The shape of the closing piece flange is adapted to tightly fit the building side inner wall 11, the outer side inner wall 10 and the gutter bottom 8. In an embodiment, the closing piece flange 32 has a coupling surface which in use contacts the inner surface of the gutter 1 for providing additional attachment or sealing. In an embodiment, the coupling surface is provided with a rubber sealing strip. In use, this rubber sealing strip is between the coupling surface and the inner surface of the gutter 1. Usually, such a rubber strip will be slightly compressed for improved sealing. In another embodiment, the coupling surface is provided with an adhesive for attaching the closing piece flange 32 to the inner surface of the gutter 1.

[0059] In figures 5 and 6, it is illustrated how two ends of gutter 1 or gutter ends are connected using a mitre joint. Jointing rods 40 that are here 90 degree angles, i.e., corresponding to the angle of the mitre joint, having a cross section dimensioned and fitting the tubular profiles 16 are inserted in the tubular profiles 16 of one of

the gutter ends. Double sided tape end is fitted to one of the butt ends of a gutter end. Next, the gutter ends are pressed together with the other ends of the joining rods 40 inserting the tubular profiles 16 of the opposite gutter end. Once pressed together, a tape end can be applied to the inner surface or channel side and over the mitre joint 26.

[0060] For additional strength, a further joining rod 40 can be fitted in the joined outer side gutter edge grooves 17. Yet a further joining rod 40 can be fitted in the building side gutter edge groove 21.

[0061] In figure 6, a corner reinforcement bar 50 is shown. This bar can for instance be applied when a ready-to-fit gutter is transported to a building site. The corner reinforcement bar 50 at its ends comprises fitting ends that fit into the respective building side gutter edge groove. These fitting ends 51 are at an opposite angle with respect to a longitudinal axis of the reinforcement bar 50. In case of a 90 degree angle of the gutter ends, both fitting ends are at 45 degrees and thus mutually at 90 degrees. Usually, the corner reinforcement bar 50 is temporary.

[0062] In figures 7-10, application of a reinforcement brace 60 for a gutter 1 is depicted. Such a reinforcement brace 60 can be applied at for instance 50 cm interspacing along the length of a gutter 1. This reinforces a gutter 1, for instance in case of heavy snowfall. In an embodiment, these reinforcement braces can be applied in winter. Gutter reinforcement brace 60 comprises a gutter brace lever 61 and a gutter brace bar 62. Gutter brace lever 61 is hingingly connected to gutter brace bar 62. The connection allows the gutter brace lever 62 and the gutter brace bar 61 to form a scissor mechanism. The gutter reinforcement brace 60 can clamp on the inner flange 23 described earlier on/near one gutter edge 9 and clamp on a flange and top surface on the opposite gutter edge. The length of the gutter reinforcement brace 60 is dimensioned to the width of the gutter 1. In this embodiment, when bringing the gutter brace lever 61 and gutter brace bar in line, one end of the gutter brace lever 61 engages the inner flange 23 at the bottom side and the corresponding end of the gutter brace bar 62 engages the opposite side of the inner flange 23. The opposite end of the gutter brace lever 61 engages the upper side of gutter edge 9 and the corresponding end of the gutter brace bar 61 engages a further inner flange 26. It is evident that operation can be reversed, with the gutter reinforcement brace 60 rotated.

[0063] When in line, the gutter brace bar 62 and gutter brace lever 61 snap together. When a gutter gets loaded with snow, for instance, the gutter 1 will have additional reinforcement.

[0064] The depicted gutter 1 of these embodiments has an alternative gutter edge strip 27. It snaps onto the gutter edge 9 via a small longitudinally extending slot and notch, and a flange snapping behind a profile. The gutter edge strip 27 has a decorative aspect, and provides an engagement surface for the gutter brace lever engage-

ment surface 64.

[0065] In figure 11, a gutter coupling assembly 20A, 20B is depicted. Such a gutter coupling assembly 20A, 20B allows a (longitudinal, water) coupling of two gutter ends 1. The depicted gutter ends (or "ends of gutter (1)") 1 correspond to the gutter 1 of figure 1. In particular, it was found that when coupling longer gutter ends, for instance for providing a continuous gutter along several houses, the dynamics of the environment and of the buildings/houses may put stress on such a (water) coupling. Dotted lines visualize the continuous coupling. The provided coupling assembly 20A, 20B allows a longitudinal change in gutter end distance. In practice, a gutter (1) can be 3-15 meters long, in practice a gutter (1) can be 3-8 meter long. In extreme circumstances, lengths due to temperature changes may change 1-5 cm.

[0066] In the current embodiment, the gutter coupling assembly 20A, 20B comprises two cooperating gutter coupling parts 20A, 20B. Each of the gutter coupling parts 20A, 20B has a gutter coupling means for coupling the respective gutter coupling part 20A, 20B to a gutter end. In the depicted embodiment, the gutter coupling parts 20A, 20B comprise a gutter coupling attachment flange 43.

[0067] Extending at opposite side of each gutter coupling part 20A, 20B, each gutter coupling part 20A, 20B comprises a complementary coupling means for coupling the gutter coupling parts 20A, 20B. In the current embodiment, one gutter coupling part 20A comprises a gutter coupling flange 41 and the complementary gutter coupling part 20B in the depicted embodiment comprises a gutter coupling sealing flange 42. This sealing flange comprises a sealing part comprising in the depicted embodiment a trench for holding a sealing rubber strip.

[0068] The outer surface of the gutter coupling flange 41 slides over the inner side of the gutter coupling sealing flange 42 in a (water) sealing manner.

[0069] In an embodiment, the gutter coupling means of the gutter coupling parts 20A, 20B each comprises a gutter coupling plate 40. The gutter coupling plates have a shape matching a cross section of the gutter (1). For attaching each of the gutter coupling parts 20A, 20B to its respective gutter (1), a connecting side of the gutter coupling plates 40 can be provided with an adhesive or for instance with a double sided tape part. With the gutter coupling plates 40 attached to its respective gutter 1, the gutter coupling attachment flanges 43 rest with a gutter side against the inner surface of its gutter 1. The dotted arrows extending try to visualize this. The gutter side of the gutter coupling attachment flange 43 can be attached to the inner surface of the gutter (1) by means of an adhesive or a double sided tape. Alternatively, the gutter side of the gutter coupling attachment flange 43 can be provided with a sealing rubber strip. In general, for providing sealing, gutter side of the gutter coupling attachment flange 43 matches the inner surface of the gutter (1). Usually, the gutter coupling attachment flange 43 extends between 0.5 and 5 cm. In general, it extends be-

tween 1 and 3 cm.

[0070] In the depicted embodiment, the gutter coupling plate 40 on its connecting side has the gutter coupling attachment flange 43 attached to it, extending from it. At its opposite side, the gutter coupling plate 40 has attached to it the gutter coupling flange 41. For the gutter coupling part 20B, the gutter coupling sealing flange 42 is attached or injected onto or together with the gutter coupling plate 40. It is provided on the gutter coupling plate 40 in such a way that the sealing surface of the gutter coupling sealing flange 42 is functionally continuous or flush with an inner surface of the gutter coupling attachment flange 43. In the depicted embodiment, the gutter coupling sealing flange 42 provides a trench for holding a rubber sealing strip (not depicted).

[0071] For allowing the gutter coupling flange 41 to slide over the gutter coupling sealing flange 42 (in fact, its sealing surface), an gutter side surface of the gutter coupling flange 41 is flush with the inner surface of gutter coupling attachment flange 43, or even a little elevated to be able to slide. The gutter coupling flange can extend between 5-10 cm from the gutter coupling plate 40.

[0072] The gutter coupling assembly in an embodiment further comprises the earlier-described gutter coupling cladding profile 28. Usually, it will be around 5-30 cm long. It is to cover the gap (distance between adjacent gutter ends) filled with the gutter coupling parts 20A, 2B. It will be attached to one of the gutter ends 1. For instance, it may be attached using adhesive, or for instance via a mechanical connection, for instance using screws.

[0073] In figure 12, an embodiment of a gutter water sensor 100 is depicted. Water sensor 100 comprises a housing 102 allowing attachment to the gutter 1. In the current embodiment, the housing comprises an attachment means for snap-coupling on further inner flange or rail 26. The housing 102 may for instance snap fit on the rail 26 and the gutter edge strip 27. Alternatively, the water sensor can be attached to the gutter 1 via adhesive or a mechanical attachment like a screw.

[0074] The water sensor comprises a sensor part 103 that indicates when a water level reaches a predetermined height wh. The water sensor issues a signal when this water level wh remains for a predetermined amount of time. For instance, it can measure starting from the first measurement time and measure at fixed time intervals to determine if the water level wh remains. If the water level wh remains at or above the pre-set water level wh, the water sensor can issue a wireless signal indicating clogging of the gutter 1. The water sensor 100 comprises a power source, for instance comprising a photovoltaic panel 101. The wireless signal may be transmitted using Bluetooth, Wi-Fi, ZigBee, or any similar signal processing method and protocol. The sensor part 103 is for instance set at a water level wh.

[0075] It will also be clear that the above description and drawings are included to illustrate some embodiments of the invention, and not to limit the scope of protection. Starting from this disclosure, many more embod-

iments will be evident to a skilled person. These embodiments are within the scope of protection and the essence of this invention and are obvious combinations of prior art techniques and the disclosure of this patent.

Reference numbers

[0076]

10	1 gutter
	2 inner gutter wall
	3 outer gutter wall
	4 reinforcing rib
	5 building sided outer wall
15	6 mounting recess
	7 mounting rail
	8 gutter bottom
	9 gutter edge
	10 outer side inner wall
20	11 building side inner wall
	12 undercutting (of mounting recess)
	13 gutter mounting flange
	14 mounting rail flange
	15 mounting rail body
25	16 rectangular tubular profile
	17 outer side gutter edge groove
	18 cornice
	19 cornice decorative strip
	20A, 20B gutter coupling part
30	21 building side gutter edge groove
	22 plate/panel groove
	23 Inner flange
	24 outer side outer wall
	25 outer side bottom wall
35	26 Further inner flange
	27 gutter edge strip
	28 gutter coupling cladding profile
	29 gutter attachment rail
	30 gutter closing piece
40	31 end plate
	32 gutter closing piece flange/collar
	40 gutter coupling plate
	41 gutter coupling flange/collar
	42 gutter coupling sealing flange/collar
45	43 gutter coupling attachment flange/collar
	50 corner reinforcement bar
	51 reinforcement bar fitting end
	60 gutter brace
	61 gutter brace lever
50	62 gutter brace bar
	63 gutter brace bar engagement flange
	64 gutter brace lever engagement surface
	65 gutter brace lever engagement flange
	66 gutter brace bar engagement surface
55	70 Adhesive surfaces
	100 water sensor
	101 solar panel
	102 housing comprising processor and wireless

transmitter
 103 water sensing end
 B Building side
 O Outer side
 wh water height

Claims

1. A gutter assembly, comprising a gutter (1) which is double walled, and comprises an inner (2) and an outer wall (3) and ribs (4) connecting said inner and outer wall (2, 3), providing a functionally self supporting gutter (1), the gutter assembly further comprising:
 - an attachment rail extending along a length and at a building side outer wall part (5) of the gutter (1);
 - a mounting rail (7) comprising a mounting ledge (14) fitting said gutter rail and comprising an attachment end (15) for attaching said mounting rail (7) to a building.
2. The gutter assembly according to claim 1, wherein said attachment rail comprises a mounting recess (6) in said outer wall part (5), and said mounting rail (7) comprising a mounting ledge (14) fitting said attachment rail.
3. The gutter assembly according to claim 2, wherein said mounting recess (6) comprised an undercut groove, and said mounting rail (7) comprises a U-shaped edge fitting, in particular snap-fitting, into said undercut groove of said mounting recess (6).
4. The gutter (1) assembly according to any one of the preceding claims, wherein said inner gutter wall (2) comprises a gutter bottom (8), a building side inner wall (11) extending from said gutter bottom (8) and an opposite outer side inner wall (10) extending from said gutter bottom (8), and said gutter (1) comprising an building side gutter edge (9) and an opposite outer gutter edge (9).
5. The gutter (1) assembly according to any one of the preceding claims, further comprising a gutter coupling assembly for coupling two gutters (1) with their ends for providing a continuous gutter.
6. The gutter (1) assembly of claim 5, wherein said gutter coupling assembly comprises:
 - a first gutter coupling part (20A) comprising a gutter attaching end (43) for attaching to said end of one of said two gutters (1), and a first closing flange (41), and
 - a second gutter coupling part (20B) comprising a gutter attachment end (43) for attaching to said
- end of the other of said two gutters (1), and gutter coupling sealing flange (42) complementary with said first closing flange (41) to provide a water tight coupling.
7. The gutter (1) assembly of claim 6, wherein:
 - said first gutter coupling part (20A) comprising a gutter attaching end (43) for attaching to said end of one of said two gutters (1), and a first coupling flange (41), and
 - said second gutter coupling part (20B) comprising a gutter attachment end (43) for attaching to said end of the other of said two gutters (1), and gutter coupling sealing flange (42) shaped for in operation allowing said first coupling flange (41) to slide over said gutter coupling sealing flange (42).
8. The gutter (1) assembly of the previous claim, wherein said gutter attachment end of said first and said second gutter coupling part (20A, 20B) each comprise a coupling plate (40) substantially matching a cross section of said gutter (1), for attaching, in particular fixing, to a gutter end, for instance fixing using adhesive.
9. The gutter (1) assembly of any one of claims 6-8, wherein said gutter attachment end (43) further comprises a gutter coupling attachment flange (43) comprising an outer surface matching an inner surface of the gutter (1) for allowing coupling, in an embodiment attaching, the gutter coupling attachment flange (43) and said inner surface of the gutter (1).
10. The gutter (1) assembly of any one of claims 6-9, wherein said coupling flange (41) has a gutter side, and said second sealing flange (42) has a sealing surface which sealing surface and gutter side are sealingly flush with an inner surface of the gutter attachment flange (43).
11. The gutter assembly of claim 1, wherein said gutter (1) is produced in a process selected from extrusion and additive manufacturing, and which is substantially from a polymer material, preferably from PVC.
12. The gutter assembly according to any one of the preceding claims, further comprising a water sensor (100) for providing a warning signal in case of gutter clogging.
13. The gutter assembly of claim 12, wherein said water sensor (100) comprises a sensing element (103) for detecting a water level in said gutter, in an embodiment extending into said gutter (1) up to a predefined height above a gutter lower inner wall (2) for detecting water above a predefined water height level (wh)

in said gutter (1), said water sensor (100) further comprises:

- an attachment part for attaching, in particular snapping, said water sensor onto said gutter(1); 5
- a power supply, in particular a photovoltaic element (101), for providing operational electrical power to said water sensor;
- a wireless transmitter for transmitting a signal when a water level is detected. 10

14. A water sensor for determining a water level in a gutter, said water sensor comprising:

- an attachment end for attaching said water sensor on a gutter; 15
- a power source;
- a water detector coupled to said attachment end for detecting a predefined water level in a gutter once attached to said gutter; 20
- a wireless transmitter, and
- a processor for running a computer program,

wherein in particular the computer program when running on said processor when receiving a first signal from the water detector, and when receiving a further signal from said water detector at a predetermined time from said first signal, issues a gutter clogged signal via said wireless transmitter. 25

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15. A coupling assembly for coupling ends of gutter (1) together allowing water to flow between the ends of gutter (1), wherein said gutter attachment end of said first and said second gutter coupling part (20A, 20B) each comprise a coupling plate (40) substantially matching a cross section of said gutter (1), for attaching, in particular fixing, to a gutter end, for instance fixing using adhesive. 35

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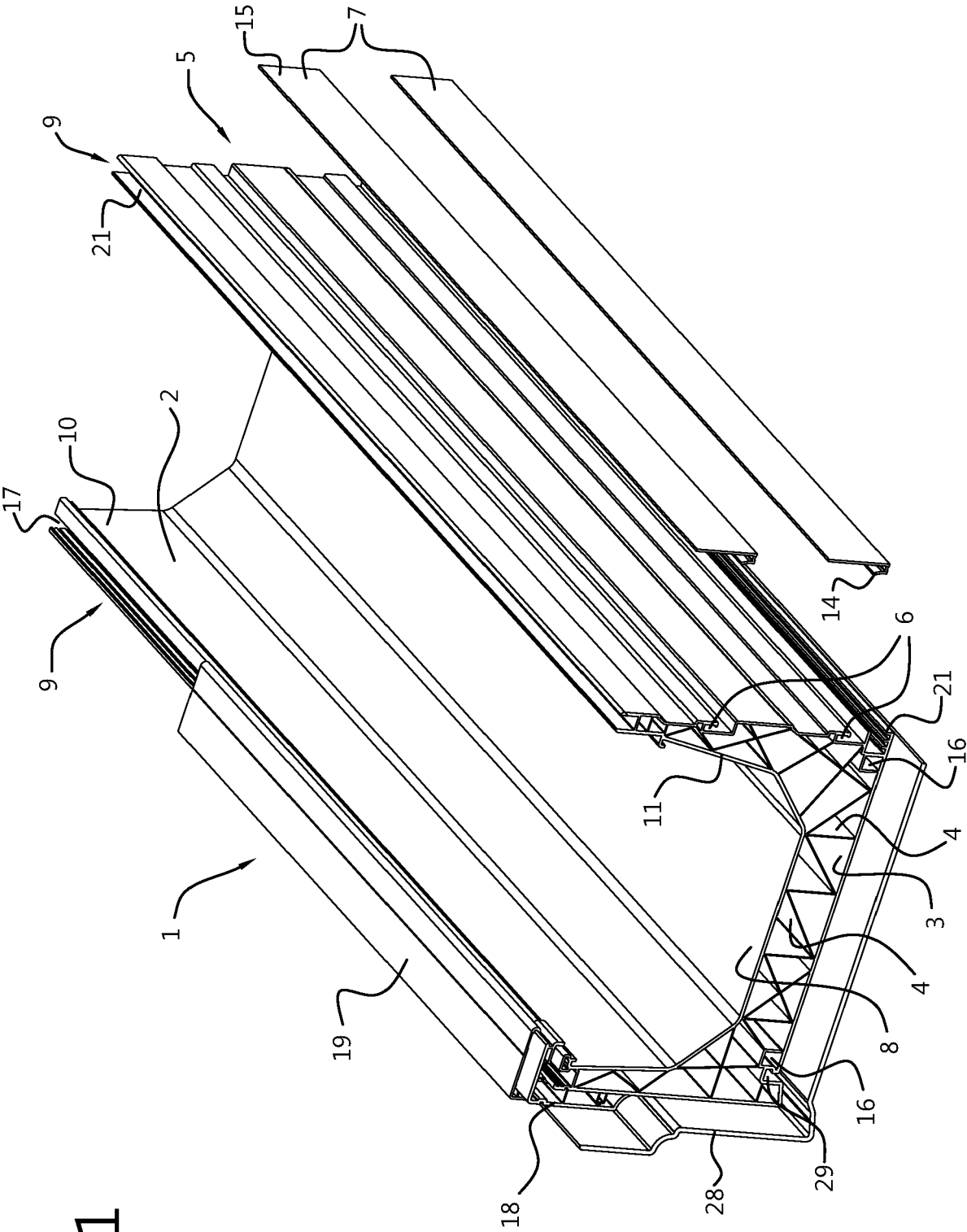
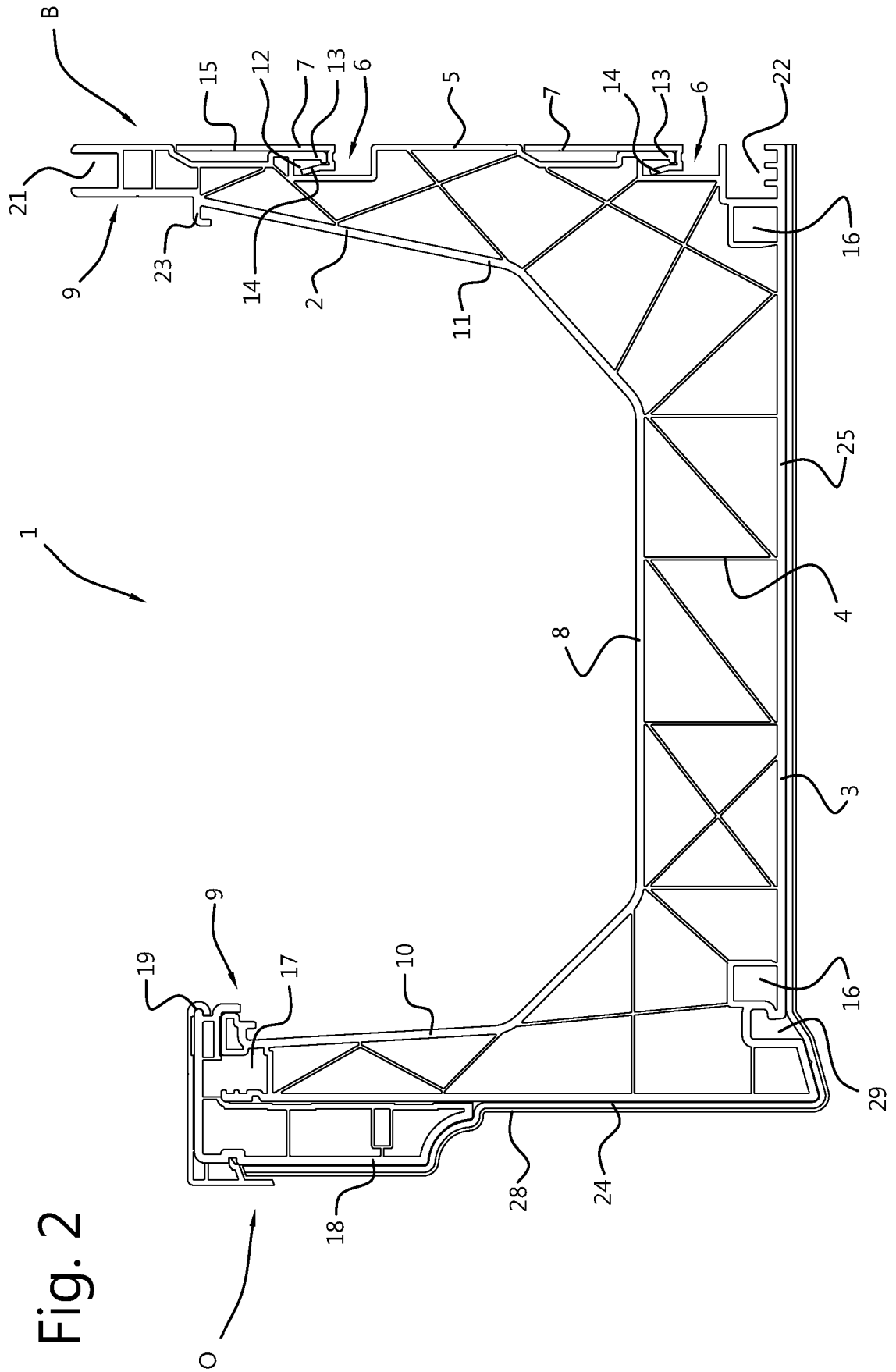


Fig. 1



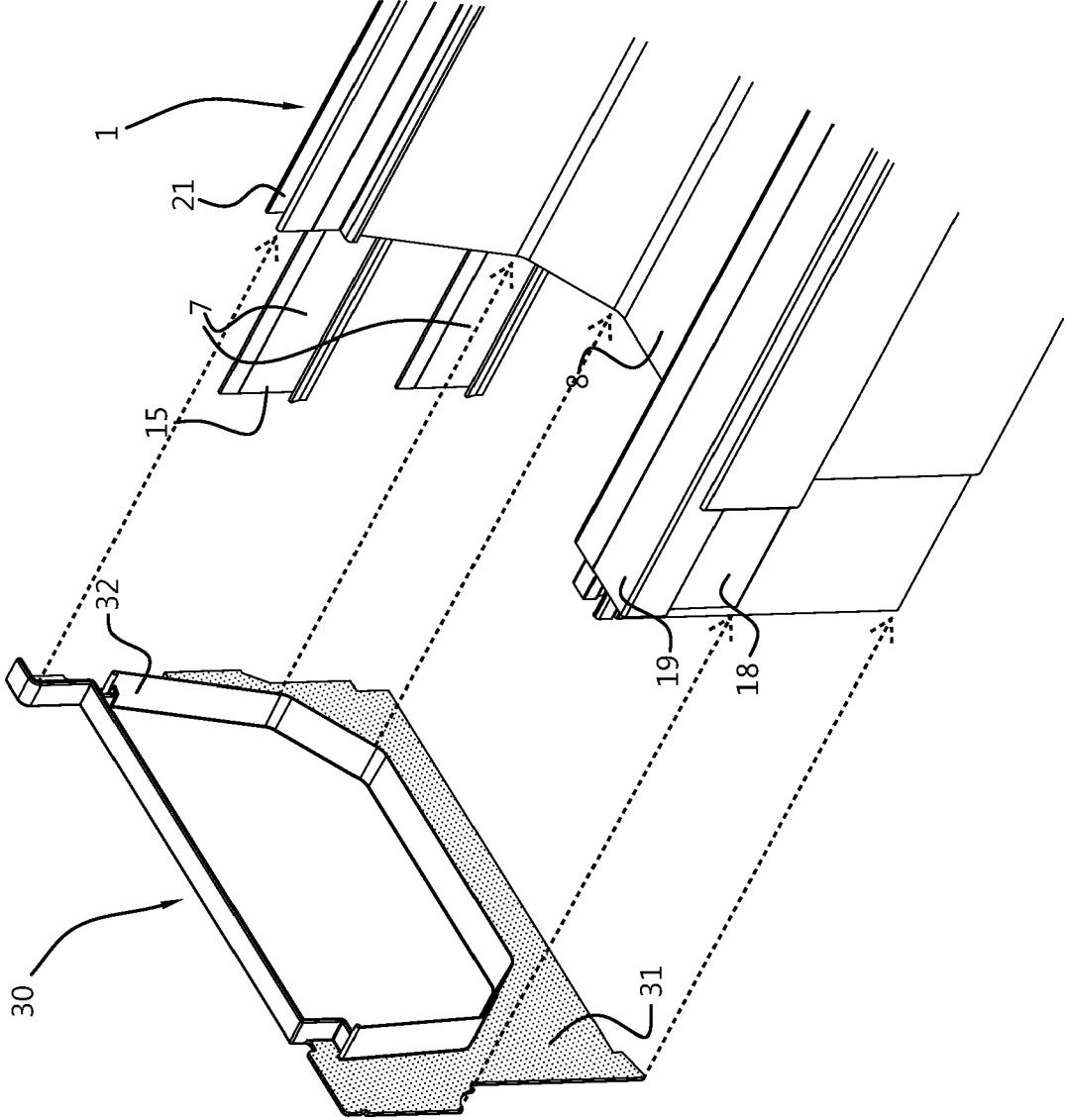


Fig. 3

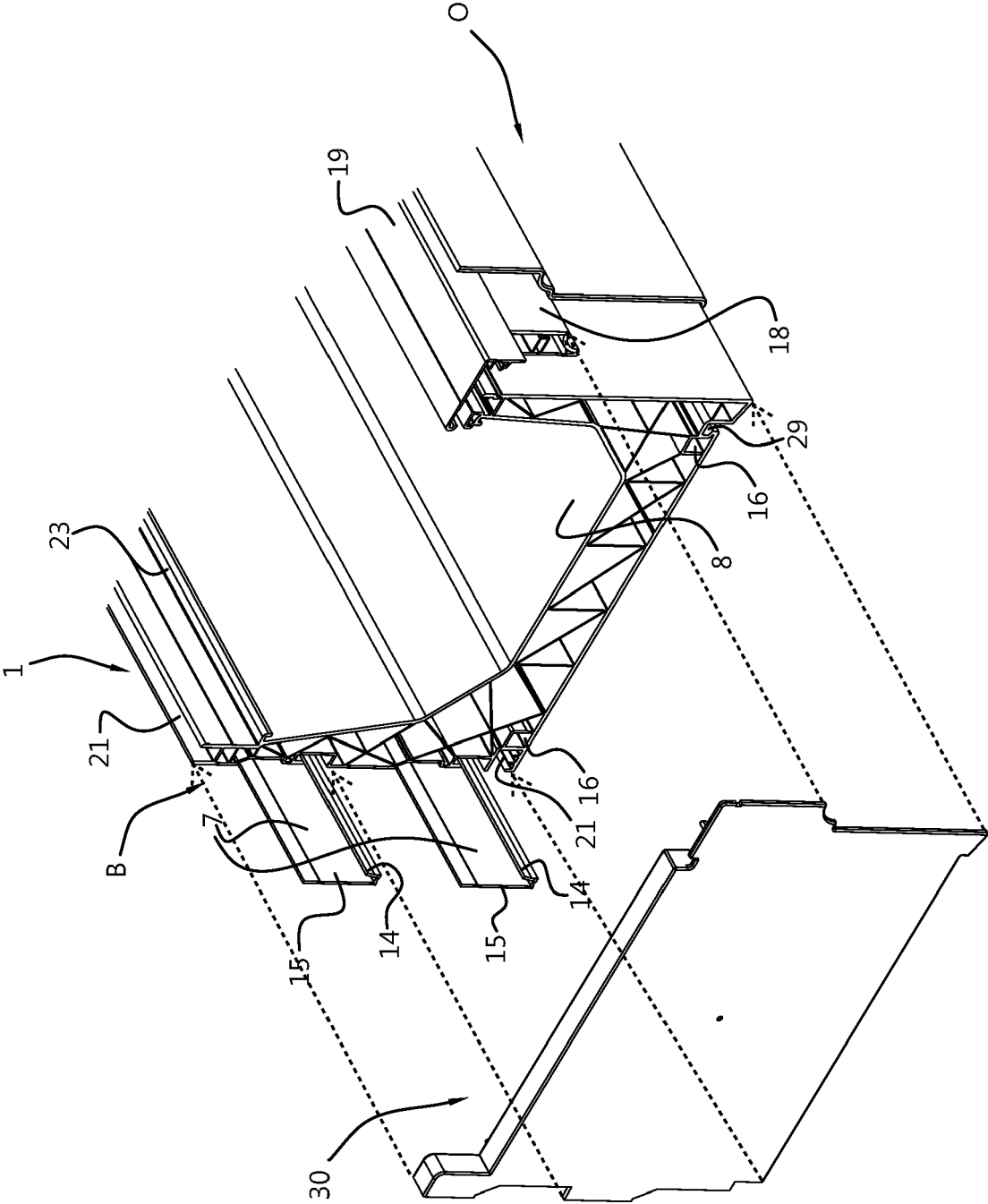


Fig. 4

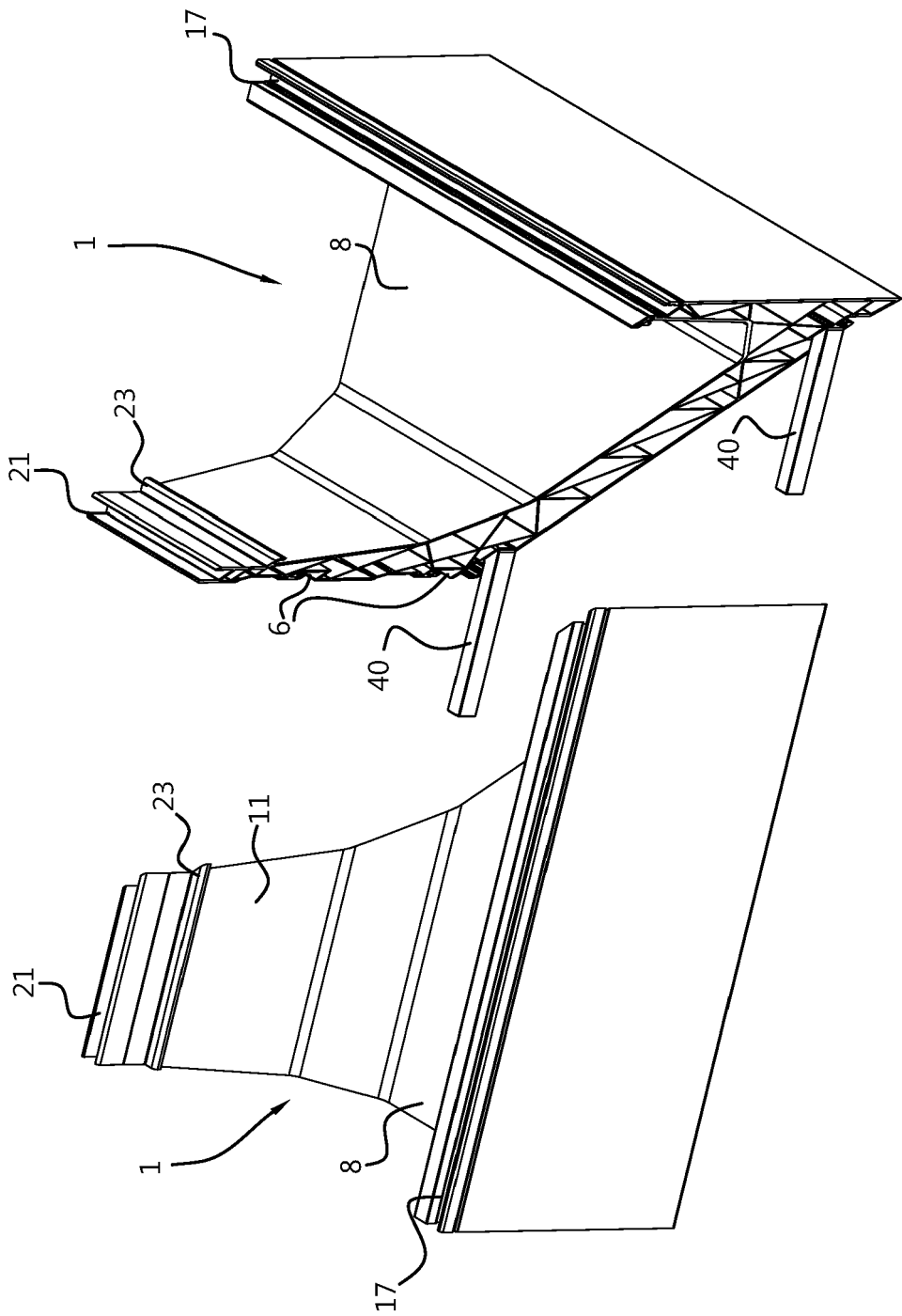


Fig. 5

Fig. 6

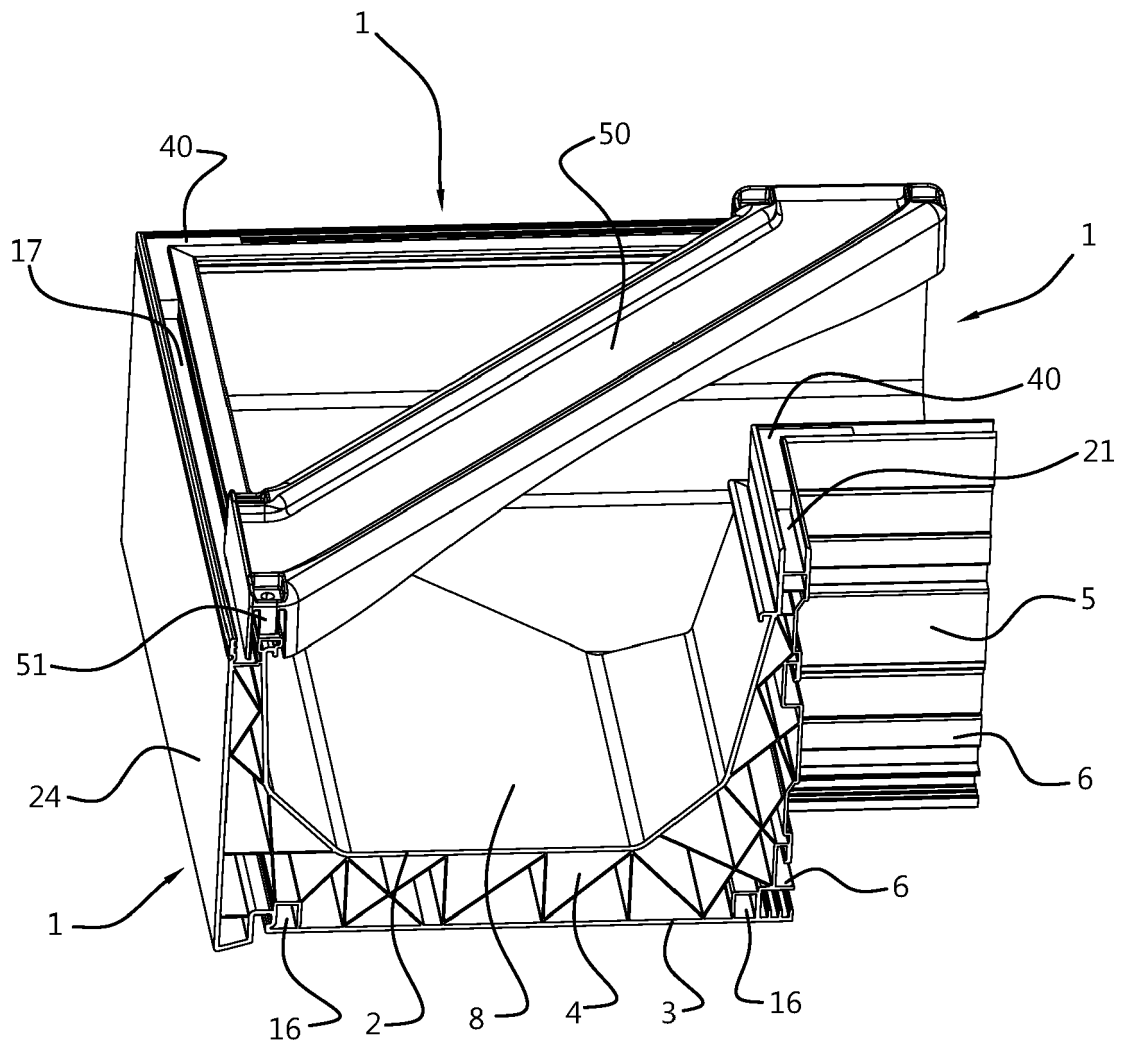


Fig. 7

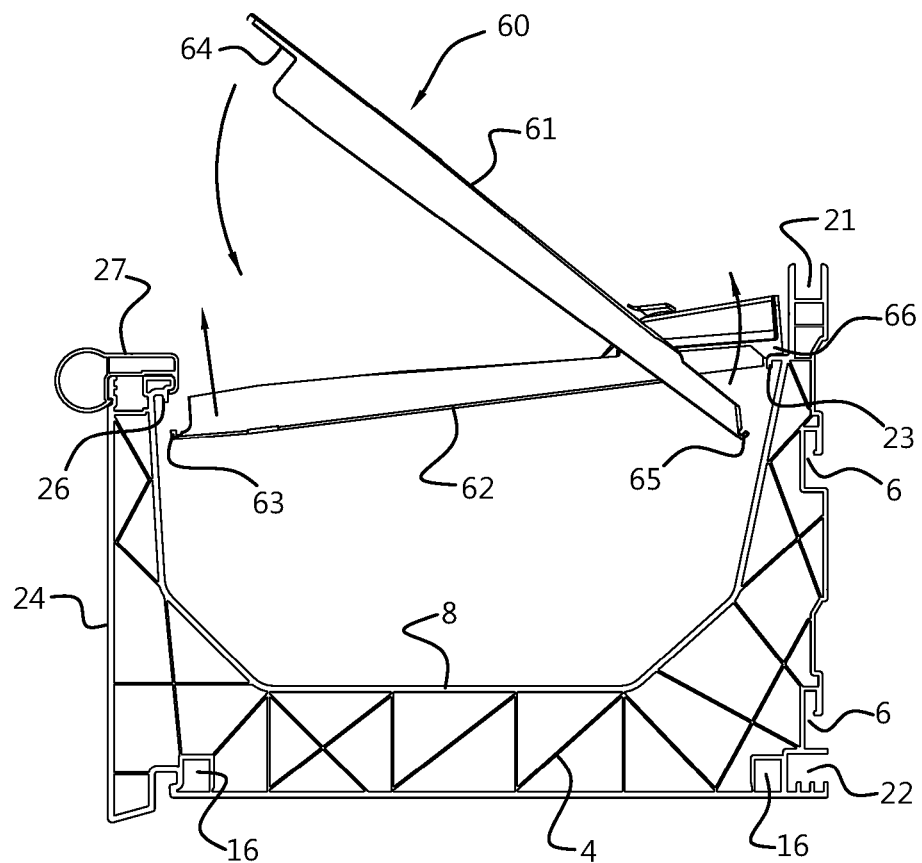


Fig. 8

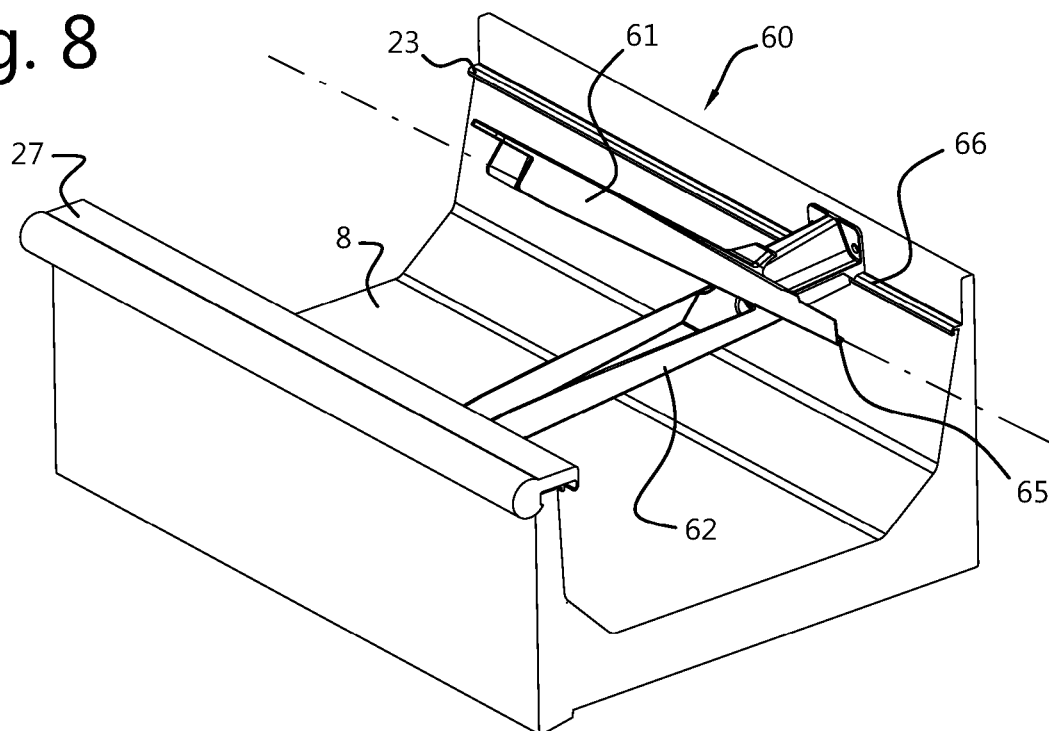


Fig. 9

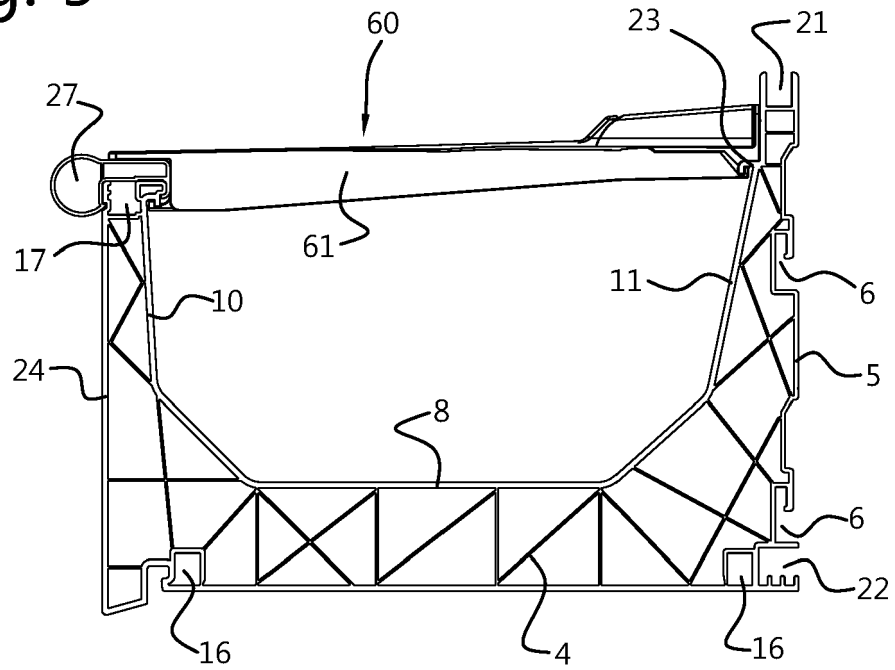
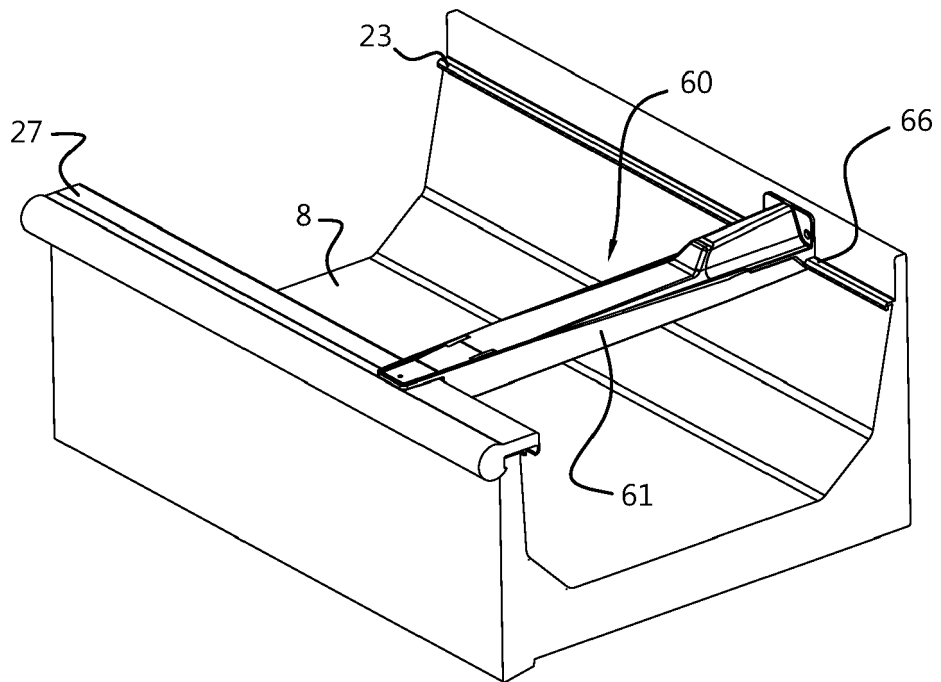


Fig. 10



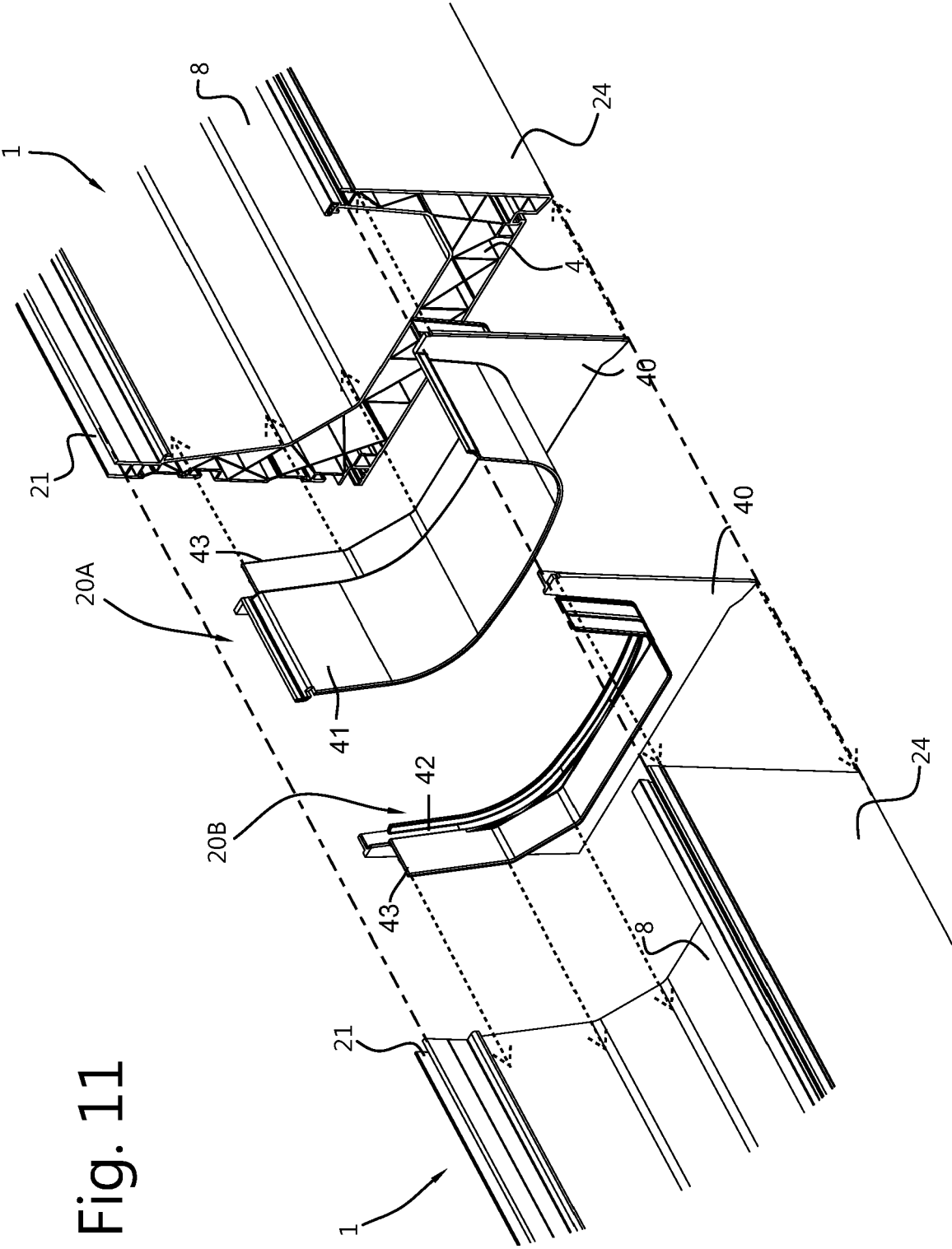
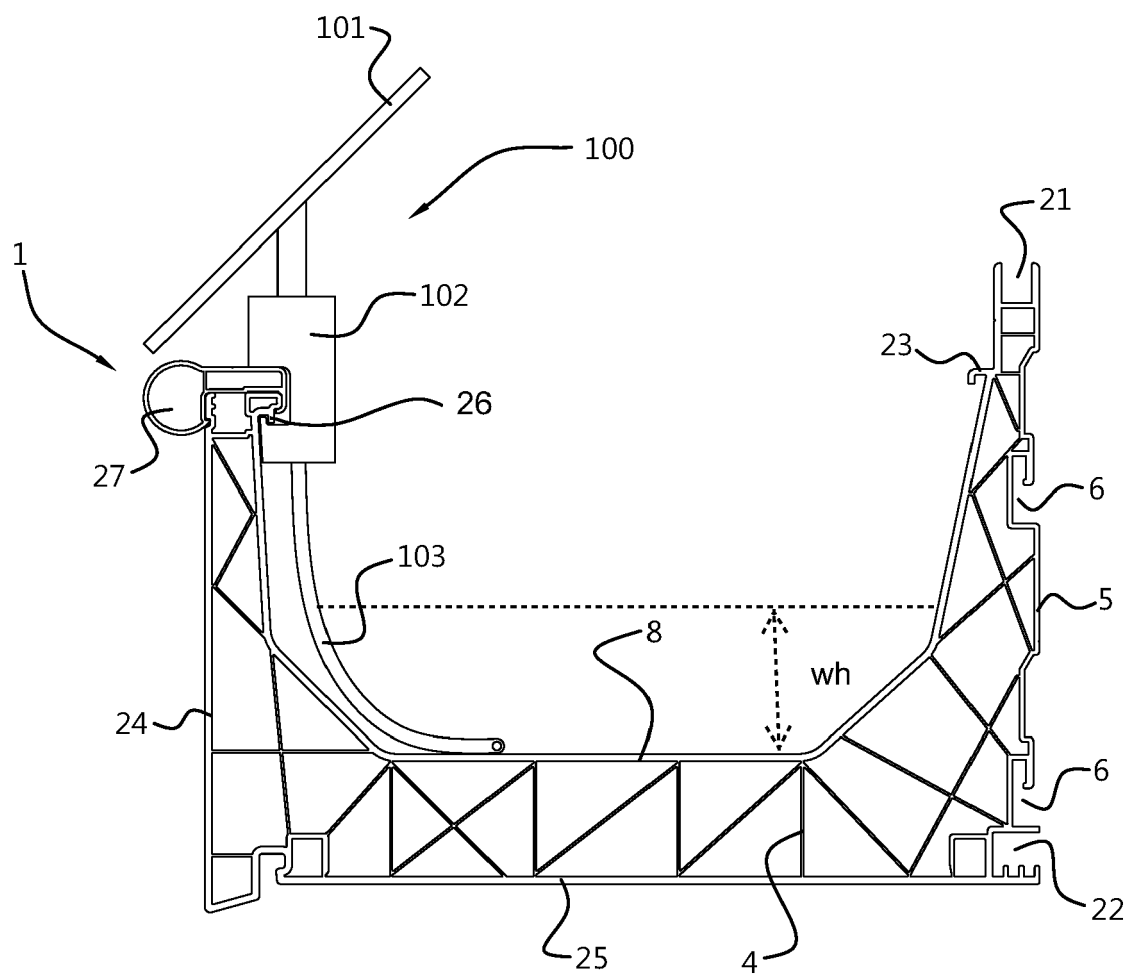


Fig. 11

Fig. 12





EUROPEAN SEARCH REPORT

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Place of search The Hague		Date of completion of the search 4 May 2021	Examiner Leroux, Corentine
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 4 May 2021	Examiner Leroux, Corentine
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☒ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).



**LACK OF UNITY OF INVENTION
SHEET B**

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The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-4, 11
 mounting the gutter to the building

2. claims: 5-10, 15
 coupling ends of gutter portions together

3. claims: 12-14
 determining a water level in a gutter

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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