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(54) **Reinforced sectional gutter**

Verstärkte Abflussrinne

Elément de caniveau renforcé

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(56) References cited:
EP-A1- 0 542 701 EP-A1- 0 789 111
US-A- 3 156 099 US-A1- 2006 072 971

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Description

[0001] The use of sectional modular gutters, made from plastics material and designed to support a grid for pedestrian and if necessary vehicular traffic, has been known for some time as a method of collecting and channelling run-off water, for example in sports installations, at the entrances of garages, in underground and semi-underground premises, at the sides of roads and elsewhere. Document EP 0 542 701 B1 provides an exemplary description of such a gutter, provided at one end with a male joint and at the other end with a female joint of the guillotine type, in such a way that a plurality of gutter modules can be positioned one after the other and interconnected to form a drainage channel of the desired length, with a strong and watertight connection in which the male joint of one module is inserted into the female joint of the next module. There is also a known way of providing, on the outer surfaces of the said gutter modules, pairs of transverse ribs spaced equally apart with an interval which is a submultiple of the total length of the module, preferably with a decimal interval, with at least the rib which faces the terminal female joint of each module reproducing a male joint, in such a way that, when the module is cut transversely, in the small space between the said connected ribs, it is possible to form a portion of gutter which also terminates in a male joint at the end produced by the cut, in such a way that a plurality of gutter modules, either whole or shortened, can be connected one after the other to form a drainage channel having the length desired on any occasion. The said connected and intermediate ribs are spaced apart by a sufficient distance to act as a saw guide when the gutter is cut to the desired length. The upper edges of the gutter are widened outwards with an L-shaped profile, so as to form a seat for containing a grid for pedestrian or vehicular traffic. Document EP 0 789 111 A1 discloses a sectional modular gutter for forming drainage channels with a grid for pedestrian and/or vehicular traffic, provided at one end with a male joint and at the other end with a female joint, of the guillotine type, in such a way that a plurality of gutter modules can be joined together and aligned in succession to form a channel of desired length, the gutter being provided on the outer lateral surface of its body with pairs of transverse ribs repeated at equal distances which are submultiples of the total length of the module and of which at least the rib facing the female end joint of a module reproduces a male joint, in such a way that, when the module is cut transversely, in the small space between the said pairs of ribs, the module portion terminates at its end produced by the cut in a male joint, and a plurality of modules, either complete or shortened can be connected in succession, to form a drainage channel having the length required on any occasion. Document US 3 156 099 A teaches to provide guillotine-type joint elements presenting more than one rib/groove.

[0002] At present, these gutters are mostly made from PVC, so that they can be welded to each other in a wa-

tertight way in the areas of connection of the male and female joints, with a structural sealant. Recently, the gutters in question have also been made from polypropylene, making it impossible to weld the connecting areas in a structural way.

[0003] The object of the present invention is to make the areas of connection of the gutter modules watertight regardless of the material from which they are made, by using sealants including non-structural sealants such as those of the silicone type, or even without using sealants, and even if the end of the gutter with the male joint is imperfectly formed or partially damaged as a result of the transverse cutting operation.

[0004] This object is achieved by a sectional modular gutter according to the appended claim 1.

[0005] Further characteristics of the invention, and the advantages derived therefrom, will be made clear by the following description which refers to the figures of the attached sheets of drawings, in which:

- Fig. 1 is a perspective view of a module of the gutter in question, inverted and viewed from the end with the male connector;
- Figs. 2 and 3 show the gutter, respectively, from the side and in a plan view from below;
- Fig. 4 is a perspective view of the end of the gutter provided with the female connector;
- Fig. 5 shows a longitudinal section through the area of connection of two gutters, with the male and female connectors coupled together;
- Fig. 6 shows other details of the gutter in a cross section taken along the lines VI-VI of Figures 2 and 3.

[0006] With reference to Figures 1, 2, 3, 4 and 6, it can be seen that the gutter in question is made by the injection moulding of plastics material, has for example a length of one metre, although it is to be understood that it can be produced with other dimensions, and has a body 1 of substantially semitubular section with longitudinal edges 101 having L-shaped retaining profiles of various heights, which form a widened area on the body 1 for containing the grid for pedestrian or vehicular traffic 2 (Fig. 6) which can be fixed, for example, with self-tapping screws 3 into the longitudinal slots 104 of thickened parts 4 provided externally on the bases of the said edges 101 (see below).

[0007] Figures 1, 2, 3 and 5 show how the gutter C has transverse fins 201, made in one piece with the outer surface of the body 1 of the gutter, these fins having their ends in contact with the bases of the said edges 101 without projecting from these, and having, when viewed frontally as in Figure 6, a half-round shape which, except for the larger dimensions, substantially reproduces the internal shape of the body 1 (see Fig. 6). One of the said fins 201 is located at a position set back by a precise amount from one end of the gutter, as shown in Figures 1, 2, 3 and 5, and the portion of the body 1 located in front of this fin has a pair of transverse projecting ribs 5,

made in one piece with the body, which terminate at the bases of the edges 101 and which form the male connector of the gutter. One of these ribs is substantially flush with, or set slightly back from, the end of the gutter, while the other, inner, rib is separated from the first rib by a distance D1 substantially equal to the thickness of one of the ribs in question. The distance D2 between this set-back rib 5 and the neighbouring fin 201 is equal to or slightly greater than the said distance D1. On the other end of the gutter C, as shown in Figures 2, 3, 4 and 5, the fin 201 has its outer face coplanar with the front of the edges 101, and an end piece 6 is formed in one piece with, and projecting from, the outer face of this fin 201, the end piece having a frontally curved shape which reproduces, with larger dimensions, the internal shape of the gutter body 1, and being provided internally with a pair of grooves 7 which form the female connector of the gutter, the inner groove having, for example, a width slightly greater than that of the other groove, whose width is slightly greater than that of the said ribs 5 of the male connector. The distance between the grooves 7 is such that, when the end with the ribs 5 of one gutter is inserted into the grooves 7 of an adjacent gutter, as shown in detail in Figure 5, the two gutters are interconnected in a substantially seamless way and the inner surfaces of their bodies 1 are coplanar with each other. The joint formed by the pair of ribs 5 which are inserted in the form of shutters into the corresponding pair of grooves 7 is of the labyrinth type and has a sinuous structure with a plurality of successive undulations which imparts exceptional qualities of rigidity and watertightness to the joint, even without the presence of silicone or other joint sealants compatible with the material from which the gutters are made. Because of the greater width of the inner groove 7 of the female connector, the joint can be made easily and correctly even if the end of the gutter or of the gutter portion (see below) with the male connector has small projections or irregularities.

[0008] The aforesaid ribs 5 of the male connectors have a rounded profile, for example, while the grooves 7 have a trapezoidal profile, but it is to be understood that any type of profile can be used for the aforesaid purposes of connection.

[0009] Like known types of drainage gutter, the gutter according to the invention has the property of double modularity, in the sense that it not only forms a module for constructing a channel by joining with other identical modules, but also has a modular structure itself, as a result of which it can be cut transversely at predetermined distances, so as to produce a piece which is entirely identical to the original module, except for its shorter length. The intrinsic modularity of the gutter module C increases the range of lengths from which a drainage channel can be constructed, since the multiples of the length of the structural module of the gutter itself can be added to the multiples of the length of one gutter. For this purpose, the body 1 of the gutter has groups G of four transverse ribs 5, located externally with a repeated and identical

interval which is a submultiple of the total length of the gutter module, for example an interval of ten centimetres, the ribs in each group being separated by the distance D1 already described with reference to Figures 2 and 3, in such a way that, by cutting one of these groups of ribs in half transversely, using the ribs as a guide for the cutting saw, it is possible to shorten a gutter module while still making it terminate in a male connector opposite to the end with the female connector. The other gutter portion created by the said cutting operation is provided with male connectors at both ends, and can be used for other purposes.

15 Claims

1. Sectional modular gutter for forming drainage channels with a grid for pedestrian and/or vehicular traffic, comprising a gutter module (C) provided at one end with a male joint and at the other end with a female joint, the joints being of the guillotine type, the gutter module (C) being provided on the outer lateral surface of its body (1) with transverse ribs (5) extending in planes perpendicular to the longitudinal axis of the gutter, the transverse ribs (5) being grouped in pair of ribs repeated at equal distances along the body (1), the distances being submultiples of the total length of the gutter module, in such a way that, when the gutter module (C) is cut transversely, in the small space between the two ribs (5) of one of said pairs of ribs (5), the resulting module portion having the female joint at one end terminates at its other end produced by the cut in a male joint, allowing a plurality of such gutter modules, either complete or shortened, to be connected in succession and form a drainage channel having a desired length on any occasion,

characterized in that:

- (a) the male joint is formed by two or more transverse ribs (5) and the female joint is formed by corresponding grooves (7) and **in that** each of said groups (G) of transverse ribs (5) is formed by at least four or more transverse ribs (5), in such a way that, when the gutter module (C) is cut in the median part of one of these groups (G), the resulting module portion having the female joint at one end is provided at its other end produced by the cut with ribs (5) reproducing the male joint, in such a way that a plurality of such gutter modules (C), either complete or shortened, can be connected to each other by connecting the grooves (7) of the female joints to the ribs (5) of a male joints, so as to form joints of the labyrinth type which are substantially sinusoidal, intrinsically highly watertight and can be easily sealed with a small amount of added material, of the silicone type for example, or

even without such added material;

(b) the gutter module (C) has the shape of a channel and has L-shaped longitudinal retaining edges (101) to contain the grid for pedestrian or vehicular traffic (2), the outer surface of the body (1) of the gutter module (C) being further provided with transverse fins (201) formed in one piece with the body and extending in planes perpendicular to the longitudinal axis of the gutter, the fins (201) having a U-shaped outline in frontal view of the gutter module (C) which, except for the greater dimensions, substantially reproduces the internal shape of the body (1), the ends of the fins (201) being in contact with the bases of the said retaining edges (101) without projecting beyond them, and one of said transverse fins (201) being set back by a precise amount from one end of the gutter module (C), wherein the portion body (1) which is located between this one fin (201) and the end of the gutter module (C) has two of the transverse ribs (5) made in one piece with the body (1) and terminating at the bases of said edges (101), to form the male joint of the gutter module (C), wherein the first of said two transverse ribs (5) of the male joint is substantially flush with or slightly set back from the end of the gutter module (C), while the other, inner, rib (5) is separated from said first rib (5) by a first distance (D1) substantially equal to the thickness of one of said ribs, while the distance (D2) between the inner rib (5) and the neighbouring fin (201) is equal to or slightly greater than said first distance (D1).

2. Gutter according to claim 1, **characterized in that** the end of the gutter module (C) having the female joint is provided with one of said fins (201), the outer face of this fin (201) being coplanar with the end of the retaining edges (101), and said fin (201) being formed in one piece with a projecting end piece (6) with a curved profile in frontal view of the gutter module (C), which reproduces with greater dimensions the internal profile of the gutter module body (1) and which is provided internally with said pair of grooves (7) which form the female joint, the inner groove (7) of said pair of grooves (7) preferably having a width slightly greater than that of the other groove (7), which in turn is slightly greater than the width of one of said ribs (5) of the male joint, the interval between said grooves (7) being such that, when the end with the ribs (5) of the male joint of one gutter module is inserted into the grooves (7) of the female joint of an adjacent gutter module, the two gutter modules (C) are interconnected in a substantially seamless way, with the inner surfaces of their bodies (1) coplanar with each other and with a considerable resistance to mechanical stresses.

3. Gutter according to any one of the preceding claims, **characterized in that** the ribs (5) of the male joint have a rounded profile, while the grooves (7) of the female joint have a trapezoidal profile.

Patentansprüche

1. Eine eingeteilte verstärkte Abflusssrinne zur Bildung von Abflusskanälen mit einem Rost für den Verkehr von Fußgängern und/oder Fahrzeugen, welche jeweils ein Abflussmodul (C) umfasst, das an einem Ende mit einer Steckverbindung und am anderen Ende mit einer Hohlverbindung versehen ist, wobei es sich um Fallverbindungsstücke handelt, und das Abflussmodul (C) an der äußeren seitlichen Oberfläche seines Körpers (1) mit entsprechenden Querrippen (5) ausgerüstet ist, welche sich in ebenen Flächen erstrecken, die senkrecht zur Längsachse der Abflusssrinne verlaufen, wobei die Querrippen (5) in entsprechenden Rippenpaaren gruppiert sind, welche jeweils in gleichen Abständen am Körper (1) entlang wiederholt werden, und die Abstände jeweils Divisoren der Gesamtlänge des Abflussmoduls sind, und zwar in einer solchen Weise, dass, wenn das Abflussmodul (C) quer geschnitten wird, der sich daraus ergebende Modulabschnitt in dem schmalen Raum zwischen den zwei Rippen (5) eines der genannten Rippenpaare (5) an einem Ende eine Hohlverbindung aufweist und an seinem anderen Ende in einer Steckverbindung endet, welche durch den Schnitt verursacht wird, wodurch eine Vielzahl solcher Abflussmodule entsteht, die entweder vollständig oder verkürzt sind, um in der Reihenfolge entsprechend verbunden zu werden und jeweils einen Abflusskanal zu bilden, welcher bei jeder Gelegenheit einen Abflusskanal in gewünschter Länge aufweist, **dadurch gekennzeichnet, dass:**
 - a) die Steckverbindung jeweils durch zwei oder mehrere Querverbindungen (5) gebildet wird, und die Hohlverbindung durch dementsprechende Rillen (7) gebildet wird, sowie dadurch, dass jede der genannten Gruppen (G) der Querrippen (5) durch mindestens vier oder mehrere Querrippen (5) gebildet wird, und zwar so, dass wenn das Abflussmodul (C) im mittleren Bereich einer dieser Gruppen (G) geschnitten wird, der entsprechende Modulabschnitt mit der Hohlverbindung an einem Ende jeweils an seinem anderen Ende durch den entsprechenden Schnitt mit Rippen (5) ausgerüstet ist, die die Steckverbindung nachbilden, und zwar so, dass eine Vielzahl dieser Abflussmodule (C), entweder vollständig oder verkürzt, jeweils miteinander durch die Verbindung von Rillen (7) der Hohlverbindung (5) mit den Rippen (5) einer Steckverbindung (5) verbunden werden kann, so dass

entsprechende Verbindungen vom Typ Labyrinth gebildet werden, welche im wesentlichen sinusförmig sind, an sich hochgradig wasserfest, und die zudem problemlos mit einer geringfügigen Menge zusätzlichen Materials, zum Beispiel mit Silikon, beziehungsweise sogar ohne dieses zusätzliche Material abgedichtet werden können;

b) das Abflussmodul (C) die Form eines Kanals und jeweils L-förmige Längsrückhalteanten (101) aufweist, um den Rost für Fußgänger- oder Fahrzeugverkehr (2) enthalten zu können, wobei die äußere Oberfläche des Körpers (1) des Abflussmoduls (C) des weiteren mit Querrippen (201) ausgerüstet ist, welche in einem Stück mit dem Körper gebildet werden und sich in senkrechten ebenen Flächen zur Längsachse des Abflusses erstrecken, wobei die Rippen (201) in der Vorderansicht des Abflussmoduls (C), welches, mit Ausnahme der größeren Abmessungen, im Wesentlichen die innere Form des Körpers (1) nachbildet, U-förmig geformte Umrisse aufweisen, und die entsprechenden Enden der Rippen (201) jeweils in Berührung mit den Grundflächen der genannten Rückhalteanten (101) sind, ohne über diese hinaus hervorzuragen, und eine der genannten Querrippen (201) um eine bestimmte Größe von einem Ende des Abflussmoduls (C) zurückgesetzt ist, wobei der Abschnitt des Körpers (1), der jeweils zwischen dieser einen Rippe (201) und dem Ende des Abflussmoduls (C) liegt, zwei Querrippen (5) aufweist, welche jeweils einteilig mit dem Körper (1) sind und an den Grundflächen der genannten Kanten (101) enden, um die entsprechende Steckverbindung des Abflussmoduls (C) zu bilden, wobei

die erste der genannten zwei Querrippen (5) der Steckverbindung im wesentlichen fluchtgerecht oder leicht vom Ende des Abflussmoduls (C) zurückgesetzt ist, während die andere innere Rippe (5) von der genannten ersten Rippe (5) durch einen ersten Abstand (D1) getrennt ist, welcher im wesentlichen der Stärke einer der genannten Rippen entspricht, während der Abstand (D2) zwischen der inneren Rippe (5) und der anliegenden Rippe (201) jeweils der genannten ersten Rippe entspricht beziehungsweise etwas größer ist.

2. Eine Abflussrinne gemäß Anspruch 1, **dadurch gekennzeichnet, dass** das Ende des Abflussmoduls (C) mit der Hohlverbindung mit einer der genannten Rippen (201) ausgestattet ist, wobei die äußere Seite dieser Rippe (201) jeweils komplanar mit den Enden der Rückhalteanten (101) ist, und die genannte Rippe (201) einteilig mit dem vorstehenden Endstück (6) mit einem gebogenen Profil in der Vorder-

ansicht des Abflussmoduls (C) ist, welches in größeren Abmessungen jeweils das innere Profil des Abflussmodulkörpers (1) nachbildet, und welches innen mit dem genannten Paar entsprechender Rillen (7) ausgerüstet ist, die jeweils die Hohlverbindung bilden, wobei die innere Rille (7) des genannten Rillenpaars (7) vorzugsweise eine Breite aufweist, die etwas größer als die der anderen Rille (7) ist, welche wiederum etwas größer als die Breite einer der genannten Rippen (5) der Steckverbindung ist, und der Abstand zwischen den genannten Rillen (7) jeweils so bemessen ist, dass wenn das Ende mit den Rippen (5) der Steckverbindung eines Abflussmoduls in die Rillen (7) der Hohlverbindung eines anliegenden Abflussmoduls eingesetzt wird, die beiden Abflussmodule (C) jeweils miteinander in einer im Wesentlichen nahtlosen Verbindung verbunden sind, wobei die inneren Oberflächen ihrer Körper (1) jeweils komplanar miteinander sind und eine erhebliche Beständigkeit gegen mechanische Belastungen aufweisen.

3. Eine Abflussrinne gemäß einem beliebigen der vorausgegangenen Ansprüche, **dadurch gekennzeichnet, dass** die Rippen (5) der Steckverbindung ein abgerundetes Profil aufweisen, während die Rillen (7) der Hohlverbindung ein Trapezprofil aufweisen.

Revendications

1. Élément de caniveau modulaire pour former des canaux de drainage avec une grille pour la circulation des piétons et/ou des véhicules, comprenant un module de caniveau (C) muni à une extrémité d'un joint mâle et à l'autre extrémité d'un joint femelle, les joints étant du type à guillotine, le module de caniveau (C) étant muni sur la surface latérale extérieure de son corps (1) de nervures transversales (5) s'étendant dans des plans perpendiculaires à l'axe longitudinal du caniveau, les nervures transversales (5) étant groupées par paires de nervures répétées à des distances égales le long du corps (1), les distances étant des sous-multiples de la longueur totale du module de caniveau, de telle manière que, quand le module de caniveau (C) est coupé transversalement, dans le petit espace entre les deux nervures (5) d'une desdites paires de nervures (5), la portion de module résultante ayant le joint femelle à une extrémité se termine à son autre extrémité produite par découpe en un joint mâle, permettant à une pluralité de ces modules de caniveau, soit complets soit raccourcis, d'être connectés en succession et de former un canal de drainage ayant chaque fois une longueur désirée, **caractérisé en ce que** :

(a) le joint mâle est formé par au moins deux

nervures transversales (5) et le joint femelle est formé par des rainures correspondantes (7) et **en ce que** chacun desdits groupes (G) de nervures transversales (5) est formé par au moins quatre nervures transversales (5), de telle manière que, quand le module de caniveau (C) est découpé dans la partie médiane d'un de ces groupes (G), la portion de module résultante ayant le joint femelle à une extrémité est munie à son autre extrémité produite par la découpe de nervures (5) reproduisant le joint mâle, de telle manière qu'une pluralité de ces modules de caniveau (C), soit complets soit raccourcis, puissent être connectés entre eux en connectant les rainures (7) des joints femelles aux nervures (5) des joints mâles, de manière à former des joints du type labyrinthe qui sont sensiblement sinusoidaux, intrinsèquement hautement étanches à l'eau, et peuvent être facilement scellés avec une petite quantité de matière ajoutée, du type silicone par exemple, ou même sans une telle matière ajoutée ;

(b) le module de caniveau (C) a la forme d'un canal et a des bords de retenue longitudinaux en forme de L (101) pour contenir la grille pour circulation de piétons ou de véhicules (2), la surface extérieure du corps (1) du module de caniveau (C) étant munie en outre d'ailettes transversales (201) formées d'une seule pièce avec le corps et s'étendant dans des plans perpendiculaires à l'axe longitudinal du caniveau, les ailettes (201) ayant un contour en forme de U en vue de face du module de caniveau (C) qui, sauf pour les dimensions supérieures, reproduit sensiblement le profil interne du corps (1), les extrémités des ailettes (201) étant en contact avec les bases desdits bords de retenue (101) sans faire saillie au-delà de ceux-ci, et une desdites ailettes transversales (201) étant en retrait d'une quantité précise par rapport à une extrémité du module de caniveau (C), dans lequel la portion de corps (1) qui est située entre cette ailette (201) et l'extrémité du module de caniveau (C) comporte deux des nervures transversales (5) réalisées d'une seule pièce avec le corps (1) et se terminant au niveau des bases desdits bords (101), pour former le joint mâle du module de caniveau (C),

dans lequel la première des dites deux nervures transversales (5) du joint mâle affleure sensiblement ou est légèrement en retrait par rapport à l'extrémité du module de caniveau (C), alors que l'autre nervure intérieure (5) est séparée de ladite première nervure (5) d'une première distance (D1) sensiblement égale à l'épaisseur d'une desdites nervures, alors que la distance (D2) entre la nervure intérieure (5) et l'ailette voisine (201) est égale ou légèrement supérieure

à ladite première distance (D1).

2. Caniveau selon la revendication 1, **caractérisé en ce que** l'extrémité du module de caniveau (C) ayant le joint femelle est munie d'une desdites ailettes (201), la face extérieure de cette ailette (201) étant coplanaire avec l'extrémité des bords de retenue (101), et ladite ailette (201) étant formée d'une seule pièce avec une pièce d'extrémité en saillie (6) avec un profil courbe en vue de face du module de caniveau (C), qui reproduit avec des dimensions supérieures le profil interne du corps du module de caniveau (1) et qui est munie intérieurement de ladite paire de rainures (7) qui forment le joint femelle, la rainure intérieure (7) de ladite paire de rainures (7) ayant de préférence une largeur légèrement supérieure à celle de l'autre rainure (7), qui est à son tour légèrement plus grande que la largeur de l'une desdites nervures (5) du joint mâle, l'intervalle entre lesdites rainures (7) étant tel que, quand l'extrémité munie des nervures (5) du joint mâle d'un module de caniveau est insérée dans les rainures (7) du joint femelle d'un module de caniveau adjacent, les deux modules de caniveau (C) sont interconnectés d'une manière sensiblement continue, avec les surfaces intérieures de leurs corps (1) coplanaires l'un à l'autre et avec une résistance considérable aux contraintes mécaniques.
3. Caniveau selon l'une quelconque des revendications précédentes, **caractérisé en ce que** les nervures (5) du joint mâle ont un profil arrondi, alors que les rainures (7) du joint femelle ont un profil trapézoïdal.

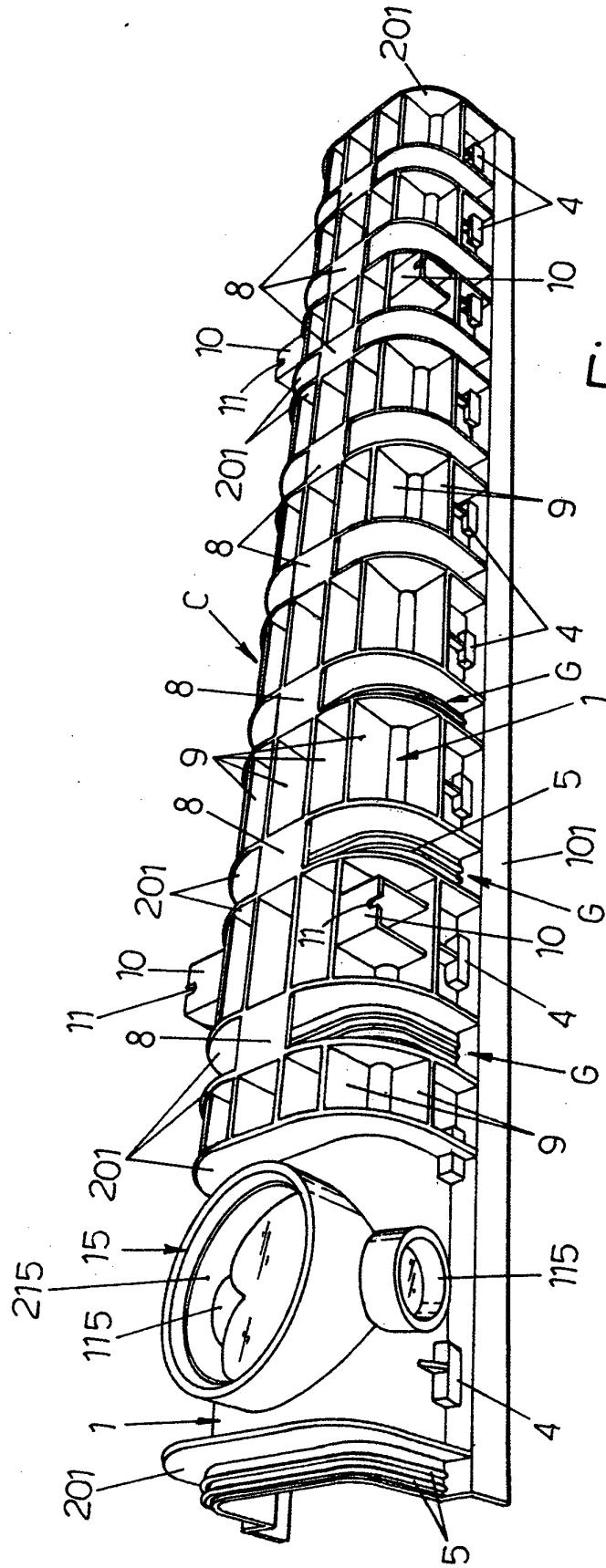


Fig.1

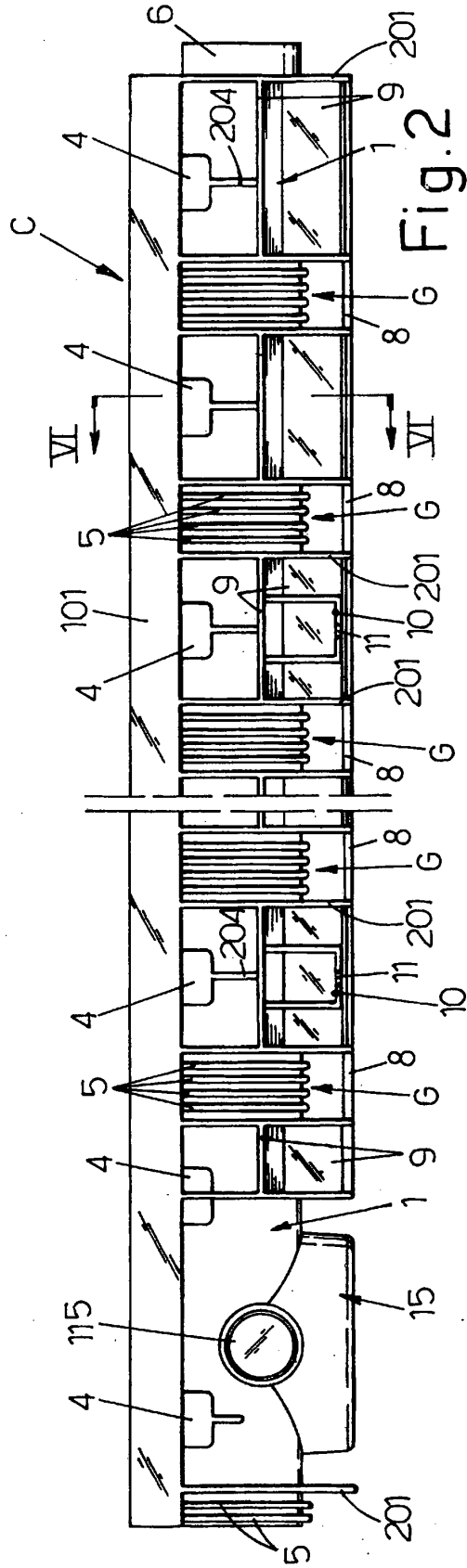


Fig. 2

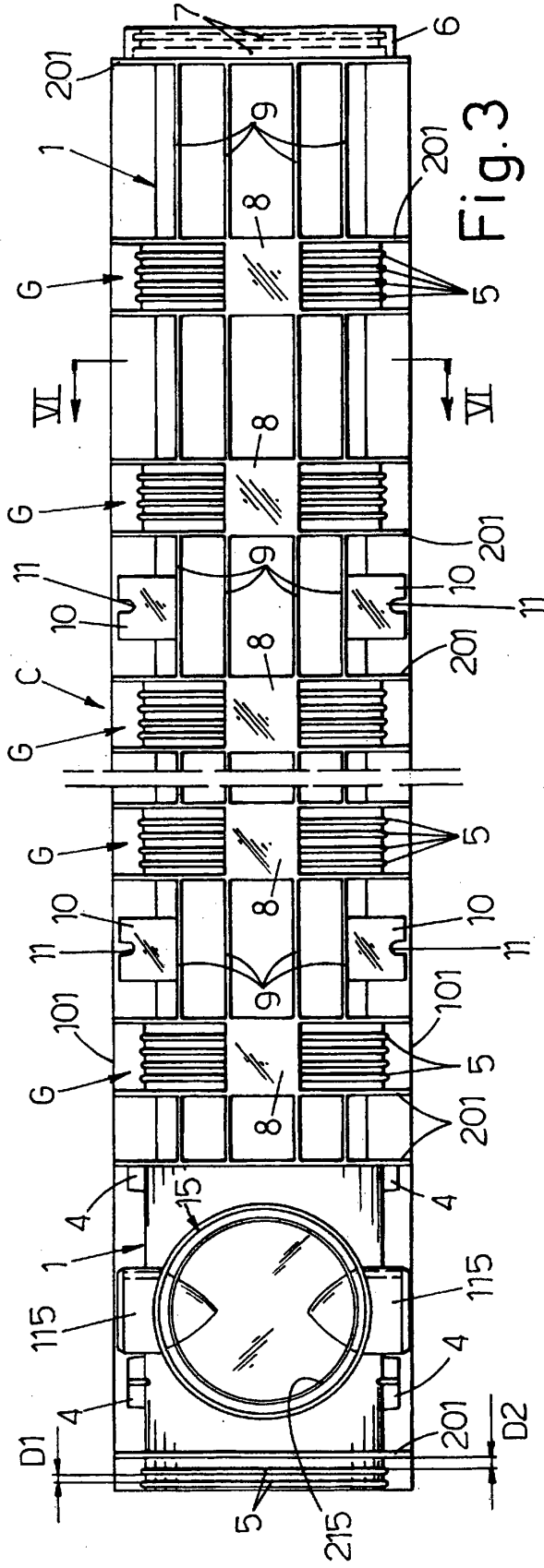


Fig. 3

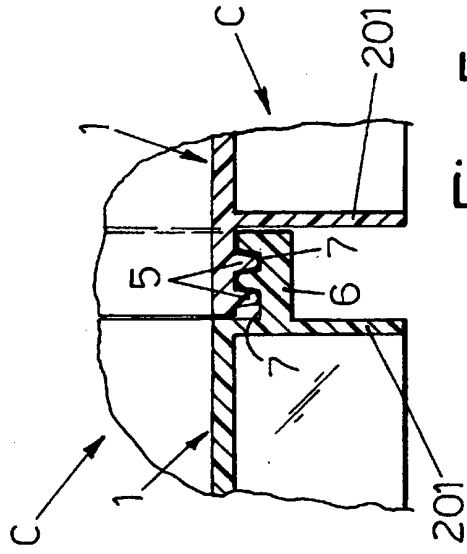


Fig. 5

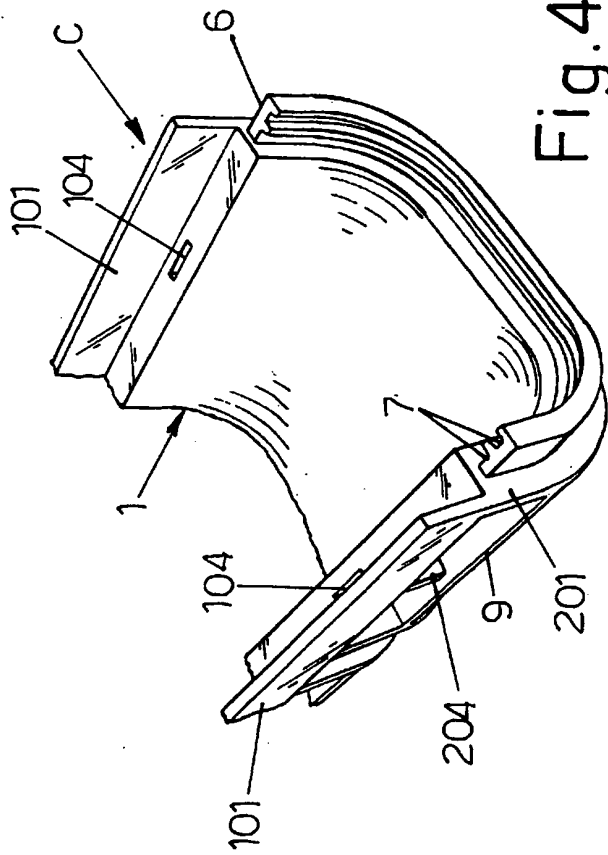


Fig. 4

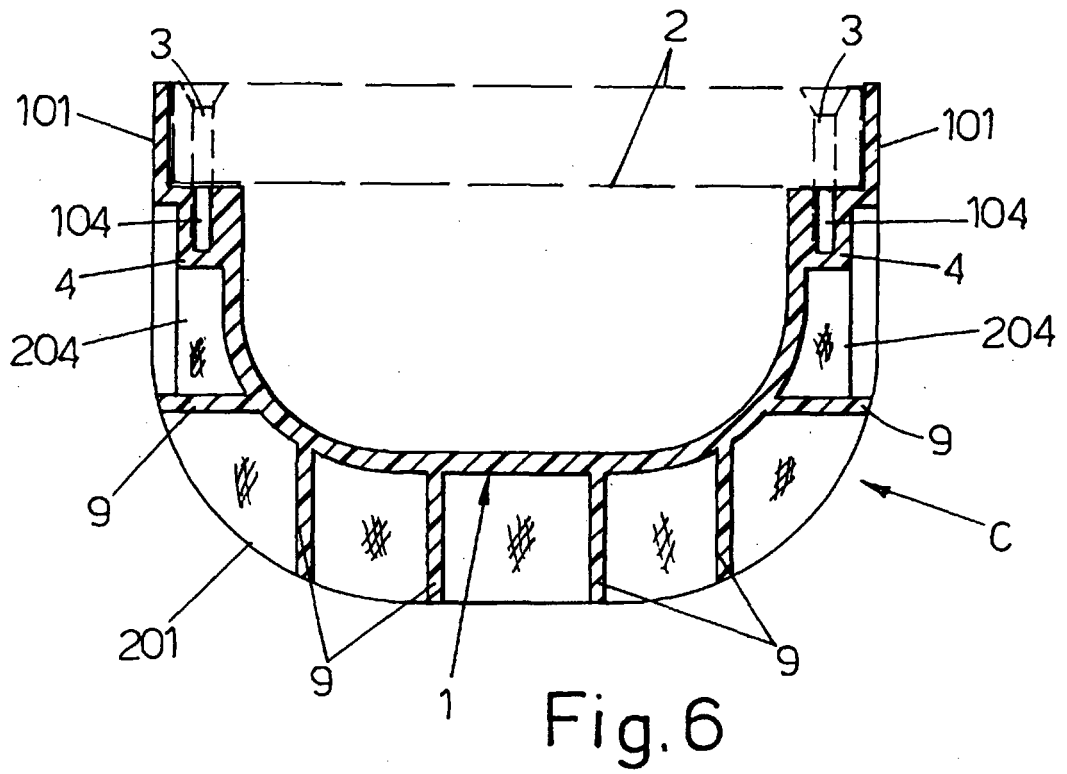


Fig. 6

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 0542701 B1 [0001]
- EP 0789111 A1 [0001]
- US 3156099 A [0001]