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(54) USE OF A SIPHONIC ROOF DRAIN SYSTEM

VERWENDUNG VON EINEM DACHENTWÄSSERUNGSSYSTEM MIT SIPHON

UTILISATION D'UN SYSTEME DE DRAIN DE TOIT SIPHONIQUE

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Description

[0001] The present invention concerns a use of a UV rainwater drain system for draining rainwater under sub-atmospheric pressure. A UV rainwater drain system, in short UV system, is a rainwater drain system which makes use of special siphonic roof drains, in particular siphonic roof drains carrying out the rainwater discharge under subatmospheric pressure.

UV rainwater drain systems are also called subatmospheric pressure rainwater drainage systems or siphonic systems.

In rainwater drainage systems, the rainwater is drained off to one or several points by making the roof slant at least gently.

[0002] From the drainage points, the rainwater is led towards a drain pipe via an opening in the roof or in a gutter.

In conventional rainwater drainage systems, the rainwater so to say falls through the drain pipe merely under the influence of gravity.

Downstream, the drain pipe is connected in an appropriate manner to a further drain.

[0003] In subatmospheric pressure rainwater drainage systems, in short subatmospheric pressure systems, the drainage of the rainwater through the drain pipe is additionally reinforced by the subatmospheric pressure which is created when air is prevented from being sucked in at the top of the drain pipe.

[0004] Subatmospheric pressure systems are known and usually comprise a drain pipe leading from a roof or collection point near the roof to a lower zone.

[0005] The higher end of the drain pipe is connected to a trough-shaped element then which is larger than the section of the drain pipe as seen from above. The higher edge of this trough-shaped element is situated higher than the feed opening of the drain pipe.

[0006] A cover plate is provided at a distance above the feed opening of the drain pipe. The cover plate has a larger surface than the section of the feed opening, but a smaller surface than the trough-shaped element.

[0007] The circumferential edge of the cover plate is provided on the inside of the top edge of the trough-shaped element, possibly at a lower level than the top edge of the trough-shaped element.

[0008] The combination of the trough-shaped element, also called the drain bottom, and the cover plate are usually called the siphonic roof drain.

[0009] In case of heavy rainfall, the water level in the siphonic roof drain rises above said cover plate, such that air is prevented from being sucked in at the top of the drain pipe.

[0010] Thus, a subatmospheric pressure is created. The pipe is entirely filled with water. Also, this is often called a full-flow system.

[0011] In other words, subatmospheric pressure systems make use of the difference in height between the siphonic roof drain and the outflow point to create a sub-

atmospheric pressure.

[0012] Subatmospheric pressure systems offer a strongly accelerated drainage of the rainwater, not only because better use is made of the drain pipe to discharge water with a restricted amount of air, but also thanks to the increased rate of flow resulting from the subatmospheric pressure.

[0013] All this makes it possible to use drain pipes with a considerably smaller section.

[0014] As explained, the existing siphonic roof drains comprise a trough-shaped element, called the drain bottom, and a cover plate, usually called the air valve.

[0015] When applying a UV rainwater drain system as an emergency drain, a few problems arise, however.

[0016] As an emergency drain system are usually provided gargoyles, traditional aerated drain systems or UV systems.

[0017] The features for an emergency drain system are provided higher than the primary rainwater discharge installation, such that they are only addressed when the rain intensity exceeds the discharge capacity of the primary system or when the primary system is not working.

[0018] Figure 1 schematically represents a known chute or siphonic roof drain to illustrate what follows.

[0019] The upstand height OS is selected such that the emergency spillways are not addressed in case of normal rainfall and with a primary rainwater drain system functioning well. A customary upstand height is between 30 mm and 60 mm, in this case for example 50 mm.

[0020] The floating height DH is the height above the siphonic roof drain at which the design discharging capacity is met.

[0021] The floating height is related to the discharging capacity of the siphonic roof drain. The larger the discharging capacity, the higher the floating height.

[0022] In conventional UV siphonic roof drains, the floating height is between 30 mm and 55 mm, in this case for example 30 mm.

[0023] These two variables, i.e. the upstand height OS and the floating height DH, determine the design height of the rainwater on the roof of a single siphonic roof drain.

[0024] In traditional aerated systems and gargoyles, this is also the height of the water line above the roof at the facility.

[0025] This is not so in UV systems, however. With the dimensions given by way of example, i.e. 50 mm for the upstand height OS and 30 mm for the floating height DH, the height of the water line above the roof may be higher than the sum thereof, i.e. in the given example higher than 80 mm.

[0026] A UV system only functions at design capacity when the water has reached the floating height DH in all the siphonic roof drains.

[0027] If a single siphonic roof drain sucks in air, the entire system will work poorly.

[0028] A higher position of one of the siphonic roof drains may be the result of customary building tolerances, as is schematically illustrated in figure 2.

[0029] Moreover, roof loads, due to the presence of rainwater, will cause roof deformations, as is illustrated in figure 3.

[0030] Such deformations result in holes and elevations or upsets being formed, as a result of which the rainwater is rearranged, as a result of which the roof load changes. All this lends a dynamic character to the roof load and deformations.

[0031] It is known that, in typical roof spans of 12 m and 24 m, deformations of for example 15 mm, 30 mm respectively may arise, i.e. 1/800 of the span, representing double maximum differences in height of 30 mm and 60 mm.

[0032] All this implies that the upset resulting from the load and the difference in height resulting from building tolerances should be added to the upstand height OS and the floating height DH in order to obtain the height of the water line above the roof.

[0033] Consequently, with the given usual dimensions of 50 mm for the upstand height OS and 30 mm for the floating height DH, and 30 mm to 60 mm for the possible maximum differences in height, and a building tolerance of for example 10 mm, the height of the water line above a lower part of the roof can already be determined at 120 to 150 mm, which may cause the roof construction to collapse.

[0034] Roofs collapsing due to water loads occurs regularly, and the sensitivity of UV systems to height tolerances plays an important role here.

[0035] A water line which is locally too high will require adjustments to lower the water line.

[0036] It is assumed at present that this can be done by applying one or several of the following measures.

- Replacing elevated, larger siphonic roof drains by several smaller siphonic roof drains. Smaller siphonic roof drains have a smaller floating height, so that with less water on the roof, air is prevented from being sucked in.
- It is also possible to lower the upstand height of the emergency spillway siphonic roof drains, but this is disadvantageous however, in that the emergency spillway system is activated sooner and thus is soiled more often.
- A third method consists in cutting off the siphonic roof drains that are situated too high in order to prevent air from being sucked in. The lacking discharging capacity has to be provided on lower roof parts.
- A fourth option consists in separating a roof part and providing a separate emergency spillway system.
- Finally, lower roof parts can be filled with insulation material.

[0037] The present invention aims to provide an alternative and adequate solution to the problem discussed above.

[0038] To this end, the invention concerns a use of a

UV rainwater drain system according to claim 1.

[0039] When applied as an emergency drain, whereby said siphonic roof drain is applied on an upstand with an upstand height OS, the bottom edge of the air valve is preferably situated under the level of the upstand height.

[0040] Preferably, the above-mentioned UV system concerns an emergency drain system whereby the siphonic roof drains are provided at a distance.

Preferably, in that case, the air valves have such a shape and dimensions that the bottom edge of the air valve is preferably situated under the level of the upstand height.

[0041] Consequently, the roof can be built with less stringent building tolerances and especially less severe demands as far as the maximum deformation of the roof construction is concerned.

[0042] A UV system used according to the invention also functions, as opposed to the known UV systems, when the water has not reached the floating height DH in one or several of the siphonic roof drains.

[0043] Indeed, if the water remains under the floating height DH of for example one of the siphonic roof drains, for example because this siphonic roof drain is situated somewhat higher due to building tolerances and/or a slight roof deformation caused by the rainwater load, but the water level reaches above the bottom edge of the air valve of the siphonic roof drain concerned, this siphonic roof drain will not suck in any air and the other siphonic roof drains in the UV system can create a subatmospheric pressure by filling the standpipe.

The subatmospheric pressure is perpetuated, and a subatmospheric pressure discharge will occur.

A subatmospheric pressure can be created if for example 30% of the siphonic roof drains cause filling, for example when one out of two siphonic roof drains in a UV system, or one out of three, or two out of five siphonic roof drains are subject to overflow or filling.

[0044] It is clear that, the lower the bottom edge reaches under the upstand, the less water is required to create an air seal, and the less sensitive the UV system for an emergency drain becomes to possible differences in height.

[0045] In order to better explain the characteristics of the invention, the following preferred embodiment of a siphonic roof drain for draining rainwater under subatmospheric pressure according to the invention is described by way of example only without being limitative in any way, with reference to the accompanying drawings, in which:

figures 1 to 3 represent the present state of the art; figures 4 to 6 are schematic representations of variant embodiments of a siphonic roof drain of a UV rainwater drain system to be used according to the invention;

figure 7 represents a UV system to be used according to the invention.

[0046] Figures 4 to 6 schematically represent a few

mounted siphonic roof drains 1, in this case all provided on an upstand.

[0047] They all comprise a drain bottom 2 and an air valve 3, whereby the drain bottom 2 is provided with an overflow edge 4 corresponding to the highest edge of the installed drain bottom 2, and whose height corresponds to the height of the upstand in the given embodiments. The overflow edge 4 surrounds the access hole 5 of the drain bottom 2.

The air valve 3 is always characterised by its hat shape. The hat shape is a direct result of the elevated central part 6 extending over the access hole 5 of the drain bottom 2 while preserving an intermediate opening 7 on the one hand, and the lower bottom edge 8 on the other hand which, according to a special aspect of the invention, is situated lower than the overflow edge 4 of the drain bottom 2. Generally speaking, the highest part of the bottom edge 8 is situated lower than the bottom side of the air valve 3 at the overflow edge 4 of the drain bottom 2, i.e. in line with this overflow edge 4.

[0048] As shown in figure 5, the bottom edge 8 can be provided with laterally protruding parts, which apart from that can also have a bent shape.

[0049] Figure 7 represents a UV system to be used according to the invention which makes use of at least two siphonic roof drains 1a and 1b as represented in figure 4.

The UV system as represented concerns an emergency drain system. To this end, the siphonic roof drains 1a and 1b are appropriately provided with an upstand 9a, 9b respectively, both with an upstand height OS of 50 mm. The floating height DH, i.e. the height above the siphonic roof drain 1 at which the latter reaches its design discharging capacity, amounts to 30 mm for both siphonic roof drains in this case, which implies that both siphonic roof drains should stand 80 mm in the water in order for both siphonic roof drains 1a and 1b to meet the design discharging capacity.

Due to building tolerances and/or roof deformations due to loads, the siphonic roof drains 1 will not be situated at the same height. The siphonic roof drain 1b is situated for example 40 mm higher than the siphonic roof drain 1a in this case.

[0050] This implies that, when the floating height DH of 80 mm is reached for the highest siphonic roof drain 1b, the lower siphonic roof drain 1a will already be standing 120 mm in the water then.

[0051] For clarity's sake, figure 7 does not represent any components of the primary discharge system.

Downstream, both siphonic roof drains 1 of the UV system for an emergency drain are connected to an accompanying suction pipe 10a and 10b, which suction pipes 10 are connected to a common collector pipe 11 which extends mainly horizontally.

Downstream, the collector pipe 11 continues in a mainly vertically directed stand pipe 12 leading to an outflow at the surface level.

The working of the UV system according to the invention

as shown in figure 7 is simple and as follows.

The water level as represented by means of a dashed line corresponds for example to the floating height of the siphonic roof drain 1a.

[0052] Thanks to the hat-shaped embodiment of the air separator or air valve 3 of the elevated siphonic roof drain 1b, which is made such in this case that the bottom edge 8 is situated 20 mm lower than the overflow edge 4 on which the latter is provided, air is prevented from being sucked in.

Initially, the water does not flow over the overflow edge 4 of said siphonic roof drain 1b, but given the high inflow of rainwater in the lower siphonic roof drain 1a, a subatmospheric pressure discharge is initiated.

[0053] Indeed, the bottom edge 8 of the air separator 3 makes contact with the water and thus forms a siphon, excluding any air being sucked in there.

[0054] Once the subatmospheric pressure discharge has been initiated, it will be perpetuated until air is sucked in, i.e. until the water level at the elevated siphonic roof drain 1b drops under the bottom edge 8 of the air separator 3.

[0055] As a result of the subatmospheric pressure in the UV system, water can also be sucked in the drain at the elevated siphonic roof drain 1b.

[0056] If the elevated siphonic roof drain 1b were not of the type according to the invention, air would be sucked in until the water level would have risen up to the level of the air separator, i.e. up to the floating height DH concerned.

[0057] As opposed to the known UV systems, a UV system according to the invention also functions when the water has not reached the floating height in one or several of the siphonic roof drains 1.

[0058] Indeed, although the water only remains under the floating height DH of the elevated siphonic roof drain 1b, but above the bottom edge 8 of the air valve 3 of the siphonic roof drain 1b concerned, this siphonic roof drain will not suck in air, and the other siphonic roof drain 1a in the UV system can create a subatmospheric pressure by filling the stand pipe.

The subatmospheric pressure is perpetuated and a subatmospheric pressure discharge occurs.

[0059] A subatmospheric pressure can be created if for example 30% of the siphonic roof drains 1 cause a filling, for example when one out of two siphonic roof drains in a UV system, or one out of three, or two out of five siphonic roof drains are subject to overflow or filling.

[0060] It is clear that, the lower the bottom edge 8 reaches under the upstand 9, the less water will be required to achieve the air seal, the less sensitive the UV system for an emergency drain will be to any possible differences in height.

As a result, the roof can be built with less stringent building tolerances and especially less severe demands regarding the maximum deformation of the roof construction.

[0061] The present invention is by no means restricted

to the embodiments described by way of example and represented in the accompanying drawings; on the contrary, a siphonic roof drain for draining rainwater under subatmospheric pressure and a UV rainwater drain system making use of at least two of such siphonic roof drains, can be made in all sorts of shapes and dimensions while still remaining within the scope of the invention.

Claims

1. Use of a UV rainwater drain system which is provided with at least two siphonic roof drains (1a, 1b) for draining rainwater under subatmospheric pressure, with a first siphonic roof drain (1b) situated higher than a second siphonic roof drain (1a), where each of the at least two siphonic roof drains (1a, 1b) comprise at least one drain bottom (2) and an air valve (3), whereby the drain bottom (2) is provided with an overflow edge (4) corresponding to the highest edge of the installed drain bottom (2), whereby the air valve (3) is made hat-shaped and comprises a bottom edge (8) situated outside the overflow edge (4) when installed, and whereby this bottom edge (8) is situated lower than the bottom side of the air valve (3) at the overflow edge (4), wherein the bottom edge (8), when installed, is situated lower than the overflow edge (4) of the drain bottom (2), and wherein the first siphonic roof drain (1b) is placed such that when the water level corresponds to the floating height (DH) of the second siphonic roof drain (1a), i.e. the height above the siphonic roof drain (1a) at which the latter reaches its design discharging capacity, the bottom edge (8) of the air valve (3) of the first siphonic roof drain (1b) is in contact with the water and thus forms a siphon, excluding any air being sucked in there, **characterised in that** it is used in order to lower the maximum roof load due to the presence of rainwater, in particular by preventing air from being sucked in, at least at the highest siphonic roof drain (1), and possibly also at the other siphonic roof drains (1) of the UV rainwater drain system concerned, as soon as the water reaches the height of the bottom edge (8) of the single or several air valves (3).
2. Use of a UV rainwater drain system according to claim 1, **characterised in that** for each of the at least two siphonic roof drains (1a, 1b), the bottom edge (8), when installed, is situated lower than the overflow edge (4) of the drain bottom (2).
3. Use of a UV rainwater drain system according to claim 1 or 2, **characterised in that** for each of the at least two siphonic roof drains (1a, 1b), the siphonic roof drain (1) is provided on an upstand (9) and **in that** the bottom edge (8) of the air valve (3) is situated under the level of the upstand (9).

4. Use of a UV rainwater drain system according to claim 1, 2 or 3, **characterised in that** the siphonic roof drains (1) are connected downstream to an accompanying suction pipe (10), which suction pipes (10) are connected to a common collector pipe (11) extending mainly horizontally, and which continues downstream in a mainly vertically directed stand pipe (12).
5. Use of a UV rainwater drain system according to any of the claims 1 to 4, **characterised in that** it is used in order to obtain less stringent building tolerances for the roof construction.
6. Use of a UV rainwater drain system according to any of the claims 1 to 4, **characterised in that** it is used in order to obtain less stringent demands regarding the maximum deformation of the roof construction.

Patentansprüche

1. Verwendung eines UV(Umpi Virtaus)-Regenwasserabfuhrsystems, das mit mindestens zwei Siphon-Dachabläufen (1a, 1b) zur Abfuhr von Regenwasser unter Unterdruck versehen ist, mit einem ersten Siphon-Dachablauf (1b), der höher als ein zweiter Siphon-Dachablauf (1a) angeordnet ist, wobei jeder der mindestens zwei Siphon-Dachabläufe (1a, 1b) mindestens einen Ablaufboden (2) und einen Luftverschluss (3) umfasst, wobei der Ablaufboden (2) mit einem Überlaufrand (4) versehen ist, der dem höchsten Rand des installierten Ablaufbodens (2) entspricht, wobei der Luftverschluss (3) hutförmig ausgebildet ist und einen unteren Rand (8) umfasst, der sich außerhalb des Überlaufrandes (4) befindet, wenn installiert, und wobei dieser untere Rand (8) niedriger gelegen ist als die Unterseite des Luftverschlusses (3) an dem Überlaufrand (4), wobei der untere Rand (8), wenn installiert, niedriger gelegen ist als der Überlaufrand (4) des Ablaufbodens (2), und wobei der erste Siphon-Dachablauf (1b) so angeordnet ist, dass, wenn der Wasserpegel der Schwimmhöhe (DH) des zweiten Siphon-Dachablaufs (1a) entspricht, d.h. der Höhe über dem Siphon-Dachablauf (1a), auf der letzterer seine Entwurfs-Abfuhrkapazität erreicht, der untere Rand (8) des Luftverschlusses (3) des ersten Siphon-Dachablaufs (1b) in Kontakt mit dem Wasser ist und somit einen Siphon bildet, wobei ausgeschlossen wird, dass Luft hierin angesaugt wird, **dadurch gekennzeichnet, dass** es zur Senkung der maximalen Dachbelastung aufgrund des Vorhandenseins von Regenwasser angewendet wird, insbesondere durch Verhinderung von Luftansaugung, mindestens an dem höchsten Siphon-Dachablauf (1), und gegebenenfalls auch an den anderen Siphon-Dach-

abfließen (1) des betreffenden UV-Regenwasserabfuhrsystems, sobald das Wasser die Höhe des unteren Rands (8) des einzelnen oder der mehreren Luftverschlüsse (3) erreicht.

2. Anwendung eines UV-Regenwasserabfuhrsystems nach Anspruch 1, **dadurch gekennzeichnet, dass** für jeden der mindestens zwei Siphon-Dachabläufe (1a, 1b) der untere Rand (8), wenn installiert, niedriger gelegen ist als der Überlauftrand (4) des Ablaufbodens (2).
3. Anwendung eines UV-Regenwasserabfuhrsystems nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** für jeden der mindestens zwei Siphon-Dachabläufe (1a, 1b) der Siphon-Dachablauf (1) auf einem erhöhten Teil (9) angebracht ist und dass der untere Rand (8) des Luftverschlusses (3) unter dem Niveau des erhöhten Teils (9) gelegen ist.
4. Anwendung eines UV-Regenwasserabfuhrsystems nach Anspruch 1, 2 oder 3, **dadurch gekennzeichnet, dass** die Siphon-Dachabläufe (1) stromabwärts mit einer zugehörigen Saugleitung (10) verbunden sind, welche Saugleitungen (10) mit einer gemeinsamen Sammelleitung (11) verbunden sind, die sich im Wesentlichen horizontal erstreckt und die sich stromabwärts in einer im Wesentlichen vertikal gerichteten Standleitung (12) fortsetzt.
5. Anwendung eines UV-Regenwasserabfuhrsystems nach einem der Ansprüche 1 bis 4, **dadurch gekennzeichnet, dass** es zur Erhaltung weniger stringenter Bautoleranzen für die Dachkonstruktion angewendet wird.
6. Anwendung eines UV-Regenwasserabfuhrsystems nach einem der Ansprüche 1 bis 4, **dadurch gekennzeichnet, dass** es zur Erhaltung weniger stringenter Anforderungen bezüglich der maximalen Verformung der Dachkonstruktion angewendet wird.

Revendications

1. Utilisation d'un système UV pour l'évacuation des eaux pluviales qui est muni d'au moins deux drains de toiture siphoniques (1a, 1b) pour l'évacuation des eaux pluviales dans des conditions de pression sous atmosphérique, comprenant un premier drain de toiture siphonique (1b) qui est situé plus haut qu'un second drain de toiture siphonique (1a) ; dans laquelle chacun desdits au moins deux drains de toiture siphoniques (1a, 1b) comprend au moins une base de drain (2) et une soupape à air (3) ; dans laquelle la base de drain (2) est munie d'un bord de trop-plein (4) correspondant au bord le plus élevé de la base de drain (2) à l'état monté ; dans laquelle la

soupape à air (3) est réalisée avec une configuration en forme de chapeau et comprend un bord inférieur (8) situé à l'extérieur du bord de trop-plein (4) à l'état monté ; et dans laquelle ce bord inférieur (8) est situé plus bas que le côté inférieur de la soupape à air (3) au bord de trop-plein (4) ; dans laquelle le bord inférieur (8), à l'état monté, est situé plus bas que le bord de trop-plein (4) de la base de drain (2) ; et dans laquelle le premier drain de toiture siphonique (1b) est placée d'une manière telle que, lorsque le niveau de l'eau correspond à la hauteur de flottaison (DH) du second drain de toiture siphonique (1a), c'est-à-dire la hauteur au-dessus du drain de toiture siphonique (1a) à laquelle ce dernier atteint sa capacité de décharge nominale, le bord inférieur (8) de la soupape à air (3) du premier drain de toiture siphonique (1b) entre en contact avec l'eau et forme ainsi un siphon, en excluant toute aspiration d'air à cet endroit, **caractérisé en ce qu'on l'utilise** dans le but de diminuer la charge de toit maximale due à la présence d'eaux pluviales, en particulier en empêchant une aspiration de l'air, au moins au drain de toiture siphonique le plus élevé (1), et le cas échéant également aux autres drains de toiture siphoniques (1) du système UV pour l'évacuation des eaux pluviales concerné, dès que l'eau atteint la hauteur du bord inférieur (8) de la seule soupape à air ou des nombreuses soupapes à air (3).

2. Utilisation d'un système UV pour l'évacuation des eaux pluviales selon la revendication 1, **caractérisée en ce que**, pour chacun desdits au moins deux drains de toiture siphoniques (1a, 1b), le bord inférieur (8), à l'état monté, est situé plus bas que le bord de trop-plein (4) de la base de drain (2).
3. Utilisation d'un système UV pour l'évacuation des eaux pluviales selon la revendication 1 ou 2, **caractérisée en ce que**, pour chacun desdits au moins deux drains de toiture siphoniques (1a, 1b), le drain de toiture siphonique (1) est prévu sur une rainure d'étanchéité (9) et **en ce que** le bord inférieur (8) de la soupape à air (3) est situé en dessous du niveau de la rainure d'étanchéité (9).
4. Utilisation d'un système UV pour l'évacuation des eaux pluviales selon la revendication 1, 2 ou 3, **caractérisée en ce que** les drains de toiture siphoniques (1) sont reliés en aval à un tuyau d'aspiration joint (10), les tuyaux d'aspiration (10) étant reliés à un tuyau collecteur commun (11) s'étendant principalement à l'horizontale, et qui se poursuit en aval par un tuyau dressé (12) orienté principalement à la verticale.
5. Utilisation d'un système UV pour l'évacuation des eaux pluviales selon l'une quelconque des revendications 1 à 4, **caractérisée en ce qu'il** est utilisé

dans le but d'obtenir des tolérances de construction moins contraignantes pour la structure de la toiture.

6. Utilisation d'un système UV pour l'évacuation des eaux pluviales selon l'une quelconque des revendications 1 à 4, **caractérisée en ce qu'il** est utilisé dans le but d'obtenir des exigences moins strictes en ce qui concerne la déformation maximale de la structure de la toiture.

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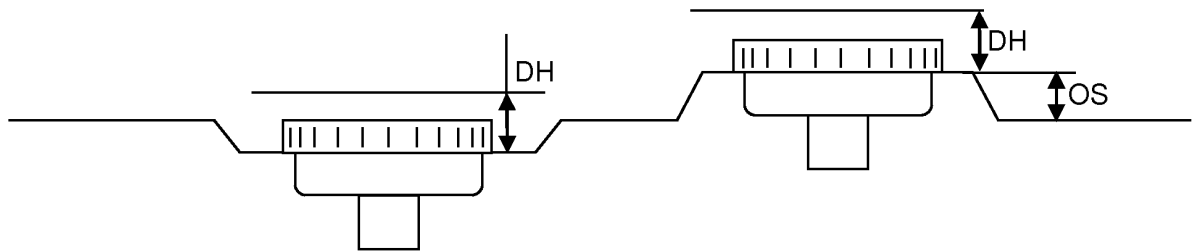


Fig 1

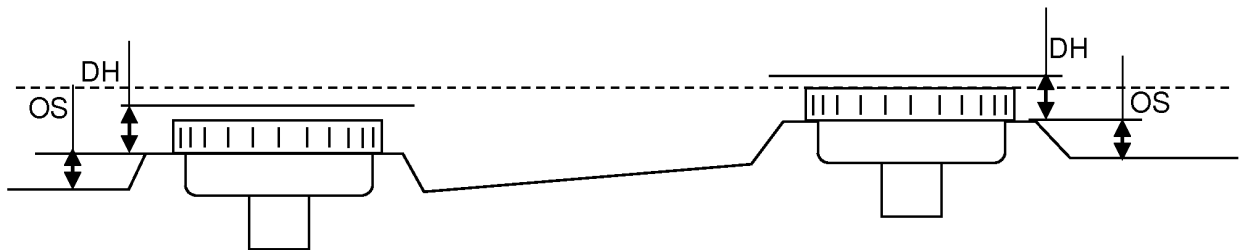


Fig 2



Fig 3

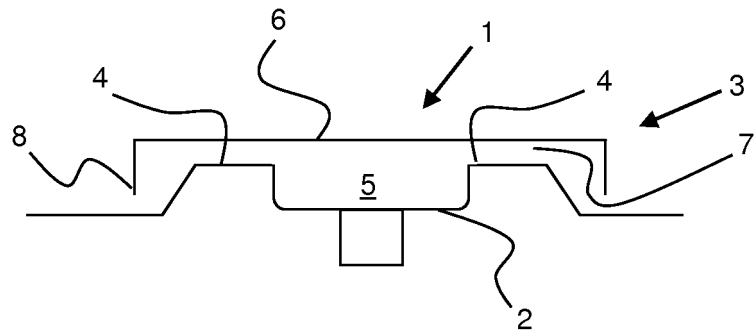


Fig 4

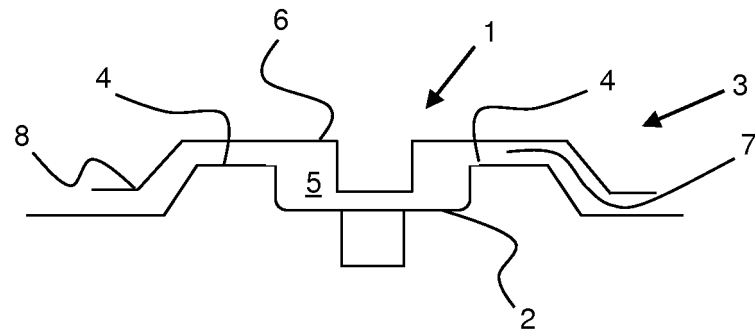


Fig 5

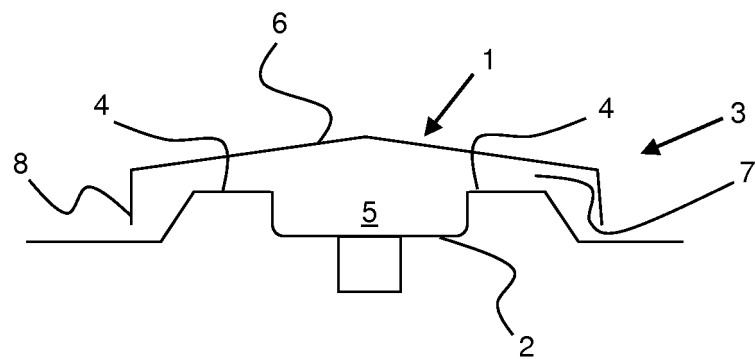


Fig 6

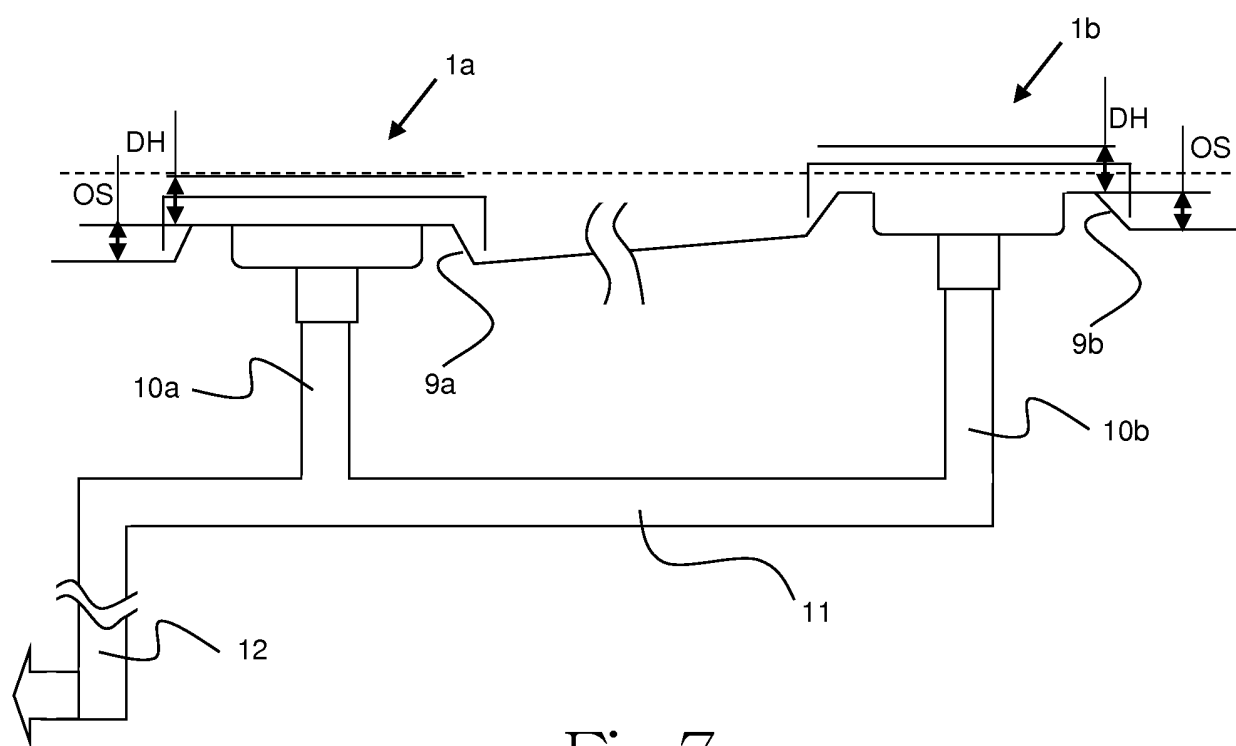


Fig 7