



US 20090065071A1

(19) **United States**
(12) **Patent Application Publication**
Vahlbrauk

(10) **Pub. No.: US 2009/0065071 A1**
(43) **Pub. Date: Mar. 12, 2009**

(54) **EMERGENCY DRAIN FOR DEWATERING AN AREA**

Publication Classification

(76) Inventor: **Wolfgang Vahlbrauk**, Bad Gandersheim (DE)

(51) **Int. Cl.**
E04D 13/04 (2006.01)
(52) **U.S. Cl.** 137/357

(57) **ABSTRACT**

Correspondence Address:
WHITHAM, CURTIS & CHRISTOFFERSON & COOK, P.C.
11491 SUNSET HILLS ROAD, SUITE 340
RESTON, VA 20190 (US)

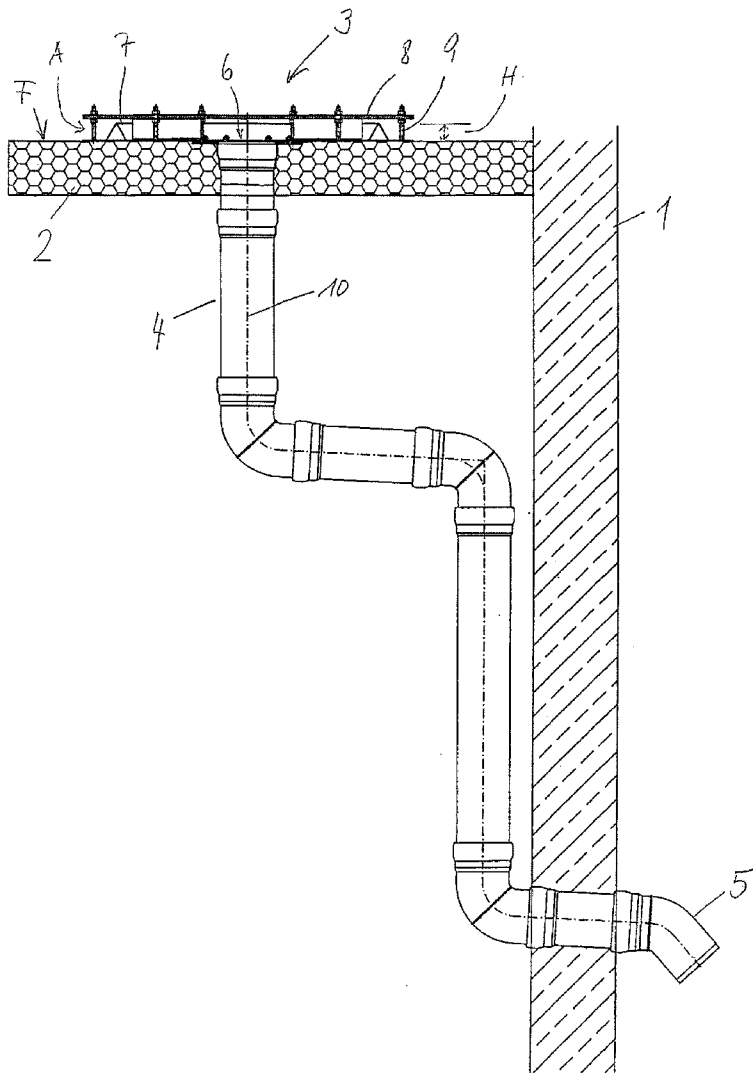
An emergency drain for dewatering an area (F) accumulating water via a discharge opening (6) connected to a drainpipe (4), with which water dammed up above a minimum dammed height (H) can be led away, having a weir (7) for damming up the water up to the minimum dammed height (H) and a top wall (8) arranged at a distance from the discharge opening (6) to prevent air being sucked into a vortex forming in the discharge opening (6), the weir (7) being arranged around the discharge opening (6) and the top wall (8), as seen from the discharge opening (6), extending as far as the other side of the weir (7), is improved with regard to the flow performance and the development of noise by the fact that the weir (7) has a cross section which, at the base of the weir (7) resting on the area (F), is provided in the flow direction (S) with a substantially greater width than at the highest point of the weir (7) over which the water flows.

(21) Appl. No.: **12/202,678**

(22) Filed: **Sep. 2, 2008**

(30) **Foreign Application Priority Data**

Sep. 7, 2007 (DE) 10 2007 042 527.0



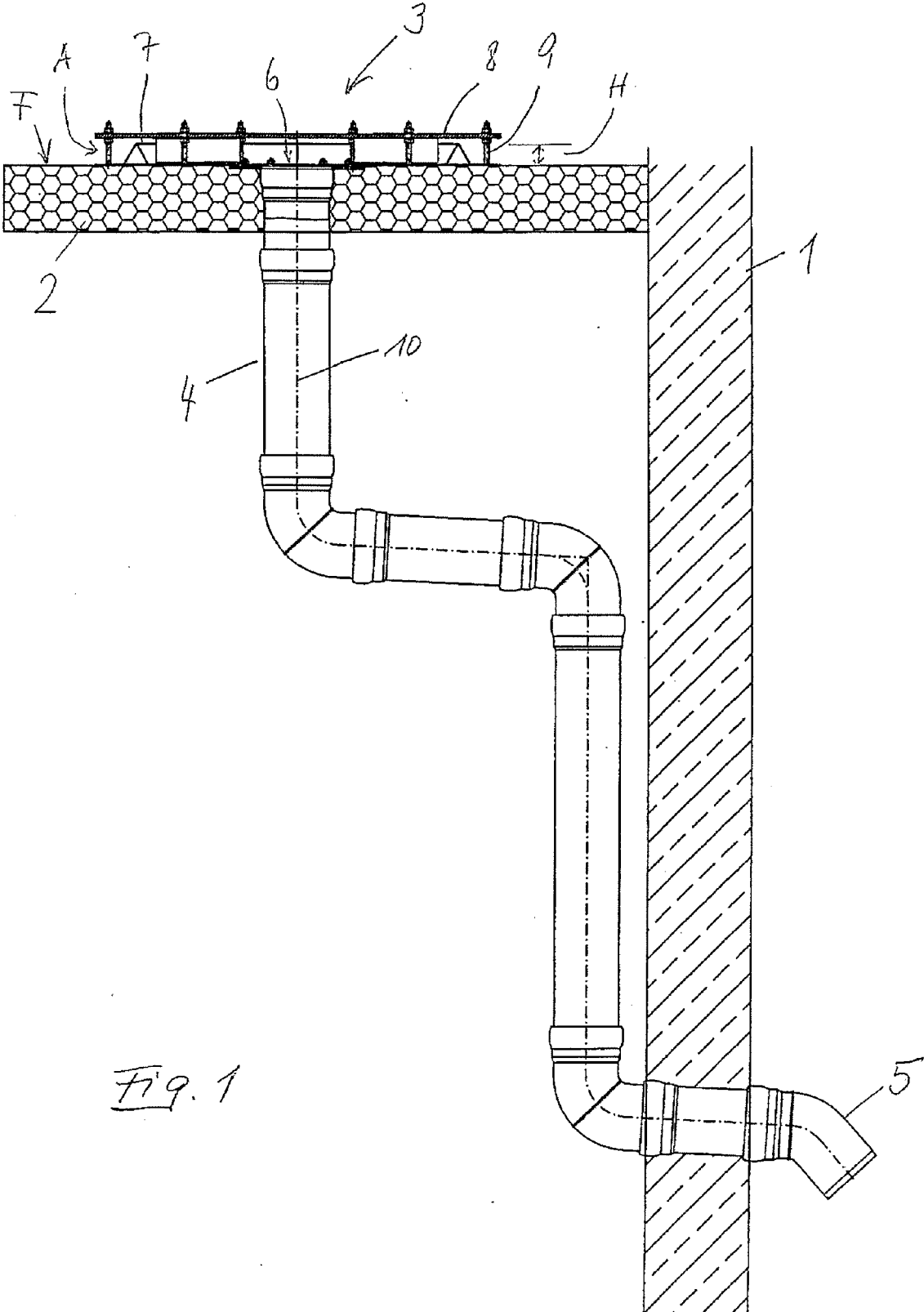
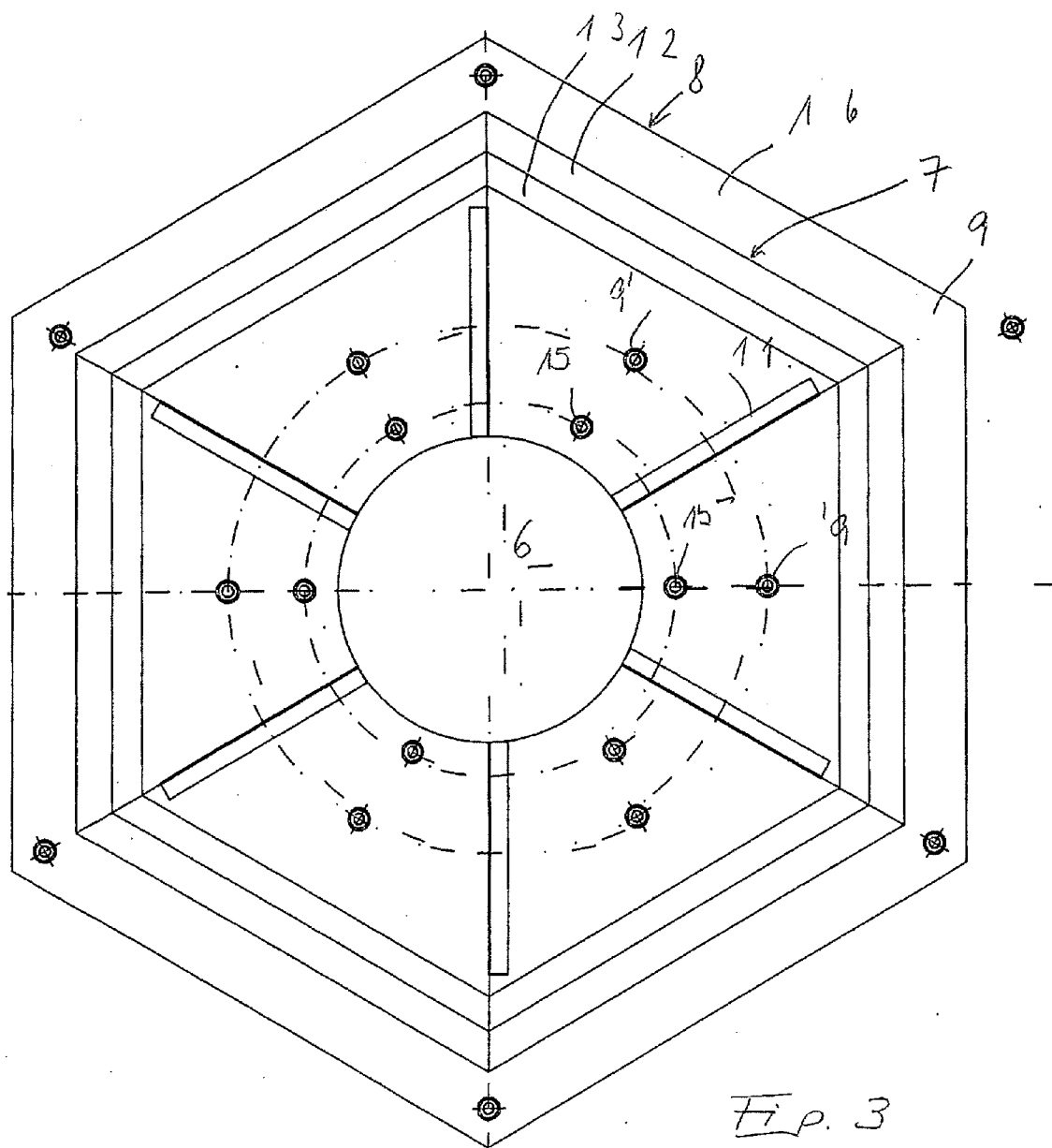
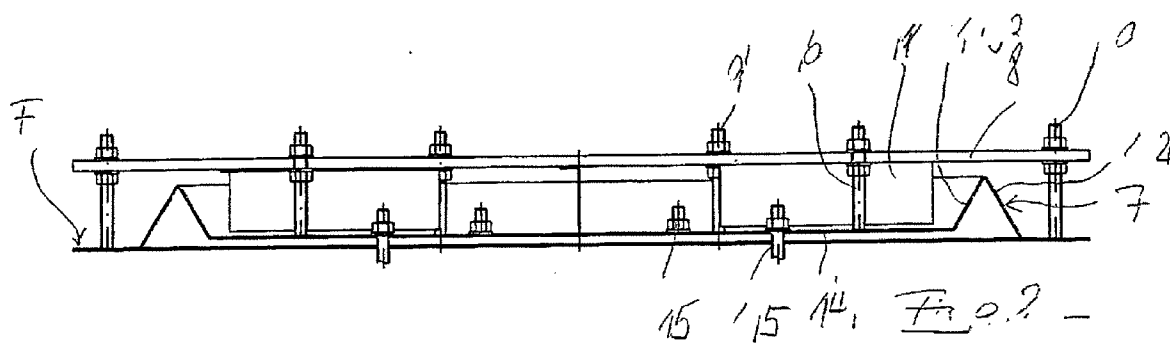


Fig. 1



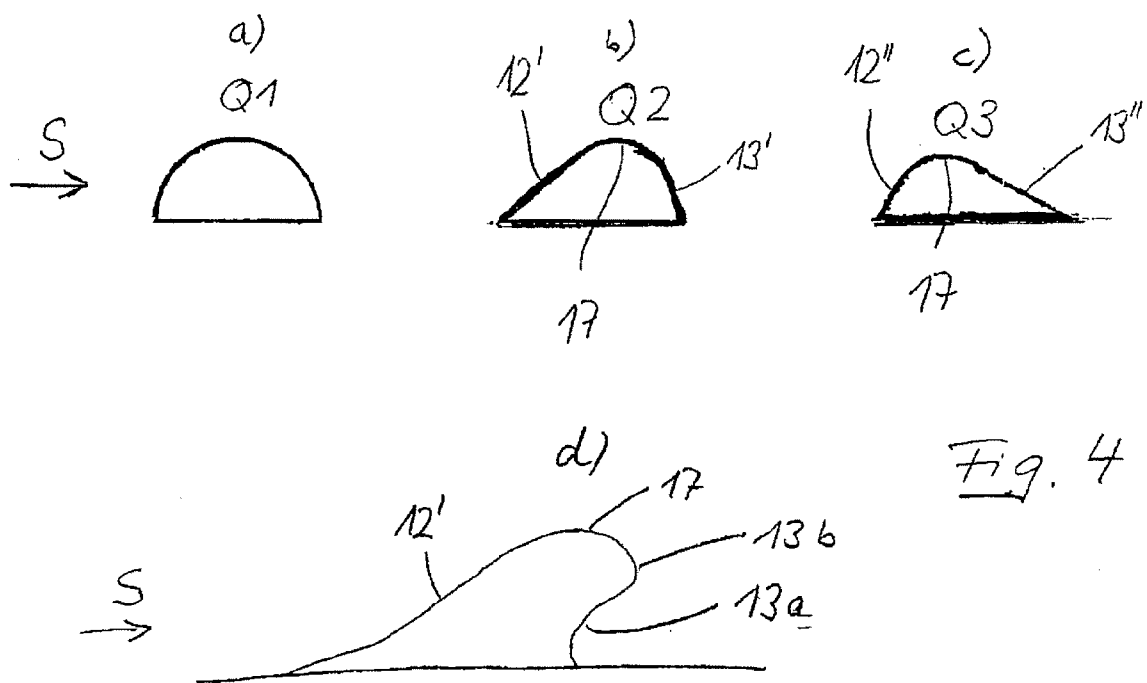


Fig. 4

EMERGENCY DRAIN FOR DEWATERING AN AREA

[0001] The invention relates to an emergency drain for dewatering an area accumulating water via a discharge opening, with which water dammed up above a minimum height can be led away, having a weir for damming up the water up to the minimum dammed height and a top wall arranged at a distance from the discharge opening to prevent air being sucked into a vortex forming in the discharge opening, the weir being arranged around the discharge opening, and the top wall, as seen from the discharge opening, extending as far as the other side of the weir.

BACKGROUND OF THE INVENTION

[0002] Emergency drains of this type are used in particular for dewatering roof areas. The function of the emergency drains is to function as a supplementary system for normal roof dewatering. With normal roof dewatering, the water is led away from the water-impermeable area. The dimensioning of the drainage system, which is to say in particular of a drainpipe, and also the number of drains for the size of a predefined area are determined in such a way that specific drainage performances can be implemented. If this drainage performance can no longer be ensured, for example because the discharge openings of the normal dewatering system permit only a reduced drainage performance—or in the extreme case no drainage at all—as a result of dirt, leaves or the like, the water rises on the roof area. As a result of the considerable weight of the accumulated water, an additional static load comes into effect which, up to a certain degree, has been taken into account when planning the building. However, it is necessary that the additional static loading does not grow beyond certain limits, since the result could then be overloading of the static strength of the building with the possible consequences resulting therefrom. The emergency drains have the function of serving to limit the accumulated water height on an area to be dewatered, in that when a minimum dammed height on the area is exceeded, the emergency drain becomes effective with a high drainage performance, which means that a further, greater rise in the accumulated water height on the area is avoided. The emergency drains are needed only infrequently, so that the risk of blockage by dirt or the like is virtually ruled out.

[0003] An emergency drain therefore includes a weir which, in the normal case, which is to say when the dammed height of the water on the area to be dewatered falls below a minimum, prevents the water being fed to the discharge opening of the emergency drain. The weir can be formed in a simple way by the drainpipe projecting by the minimum dammed height above the level of the area to be dewatered. Alternatively, an appropriate ring, formed by a pipe section, can also be arranged with a radial spacing as seen from the center of the discharge opening.

[0004] In order to achieve a high drainage performance, it is possible to construct and to dimension an emergency drain in such a way that a pressure flow forms in the drainpipe, since the drainpipe is filled by the water flowing away, possibly as a water-air mixture, and, on account of the column forming in the drainpipe, has the effect of a negative pressure in the region of the discharge opening, which means that the discharge of the water from the area to be dewatered is accelerated. From EP 1 036 894 B1 it is known to form a housing

around the discharge opening, which is entered by the water to be led away and which, above the entry slot, forms a space closed off in an airtight manner by the accumulated water, which space intensifies the production and effect of the negative pressure in the drainpipe. The space closed off in an airtight manner is closed off at the top by a top wall which, moreover, prevents air being drawn into a discharge vortex during the pressure flow but also prevents it during a preceding non-pressure flow. The weir can be located inside or outside the housing and in particular also formed by the drainpipe being lengthened upward, a funnel-like widening of the drainpipe in order to form the weir also being described.

[0005] The weirs are normally composed of sections of pipe with a relatively thin wall, over the upper edge of which the water accumulated above the minimum dammed height flows. Although the known emergency drains can be designed for the necessary drainage performances, they produce a considerable intensity of noise, in particular when a pressure flow begins.

SUMMARY OF THE INVENTION

[0006] The present invention is based on the object of improving an emergency drain of the type mentioned at the beginning with regard to its drainage performance and the development of noise.

[0007] In order to achieve this object, according to the invention an emergency drain of the type mentioned at the beginning is characterized in that the weir has a cross section which, at the base of the weir resting on the area, is provided in the flow direction with a substantially greater width than at the highest point of the weir over which the water flows.

[0008] The design of the weir for the known emergency drains has hitherto not been assigned any substantial importance. However, during the use of the emergency drain, the water to be led away flows over the weir. The present invention is based on the finding that the weir has a substantial influence on the flow of the water flowing away through the discharge opening and that, by means of a design of the weir which is more beneficial in terms of flow, the flow of the water flowing away can be improved with regard to the outflow performance and the development of noise. According to the invention, this is achieved by the water on the side flowing toward the weir and/or on the side flowing away being guided in such a way that, on the inflow side, the weir does not merely form an impediment to flow on which vortices are formed, or that, on the downstream side, the weir causes an uncontrolled fall of the water flowing over the weir over the complete height of the weir.

[0009] According to the invention, the width of the weir at the base is substantially larger than at the highest point of the weir. As a result, on the inflow side or on the outflow side or preferably both on the inflow side and on the outflow side, guidance of the water to the height of the weir and/or from the height of the weir as far as the base height is effected. In a preferred embodiment, the flanks of the weir formed in this way are designed to rise or fall continuously. However, the effect according to the invention is also achieved, even if in a somewhat attenuated form, if the flanks have step-like height differences. An improvement with respect to the prior art is also established even if only the inflow side or only the outflow side is designed as a flank guiding the water, while the other flank forms a steep wall in the conventional way. Pref-

erably, however, both flanks are provided with gradual height transitions and both contribute to the greater width of the weir at the base.

[0010] The discharge opening is preferably formed by a mouth opening of a drainpipe that is present in the area, so that the diameters of the drainpipe and of the discharge opening are coordinated.

[0011] There is a substantially greater width at the base of the weir if the width of the weir at 90% of the maximum height of the weir, measured from the base, is less than half the width of the weir at the base. As an additional condition, it is advantageous if the weir has a width at half its height of less than 80% of the width at the base.

[0012] In an embodiment of the invention which can be produced simply and functions well, the weir is provided with a triangular cross section in the flow direction. In this case, the weir preferably has a level rising flank and a level falling flank.

[0013] The same advantages can be achieved if the weir has a semicircular cross section in the flow direction.

[0014] In both embodiments, the weir is preferably formed with a symmetrical cross section in the flow direction.

[0015] For the flow over the weir, it may be advantageous if the weir has an asymmetrical cross section in the flow direction with an upstream flank and a downstream flank, the two flanks having an unequal length and mean steepness. In this case, too, the flanks can be rectilinear in cross section but also curved.

[0016] The upstream flank preferably has a lower mean steepness than the downstream flank.

[0017] If the flanks run rectilinearly over part of their length and merge into each other with a rounded portion at the highest point, the result is a profile of the weir which is reminiscent of a levee profile but which has been developed from other points of view (breaking the force of the incoming waves).

[0018] According to the invention, it is advantageous if, between the weir and the discharge opening, flow guide webs running radially toward the center of the discharge opening are provided. These can extend over the entire height between base and top wall. Their substantial function is to prevent the formation of a circulating vortex under the top wall.

[0019] As seen in plan view, the weir can be circular. In a preferred embodiment, however, the weir is formed as a uniform polygon in plan view, the flow guide webs extending in the direction of the corners. Particularly preferable is the formation of the weir as a uniform hexagon in plan view.

[0020] The height of the weir preferably extends until it is above half the spacing, further preferably until it is above two-thirds of the spacing, between the area to be dewatered and the top wall.

[0021] It is further preferred for the top wall to be formed as a level disk.

[0022] By way of clarification, it should be pointed out that the reference to the “base” of the weir in the present application signifies a reference to the lower region of the weir, which rests on the area to be dewatered. The weir does not have to have a real base but, for example, can be formed by a pressed piece of sheet metal which forms a closed ring. The definition of the weir is expedient, however, if it has a flange which can

be referred to as a “base”, with which it can for example be screwed to the area to be dewatered.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023] The invention is to be explained in more detail below by using exemplary embodiments illustrated in the drawing, in which:

[0024] FIG. 1 shows a schematic section through a building having an emergency drain system with an emergency drain according to the invention;

[0025] FIG. 2 shows an enlarged illustration of the emergency drain according to the invention;

[0026] FIG. 3 shows a plan view of the emergency drain according to FIG. 2 with the top wall removed;

[0027] FIG. 4 shows examples of possible cross-sectional shapes of the weir of the emergency drain.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0028] FIG. 1 shows, schematically, a building wall 1 and a roof structure 2 of a level roof of the building. The upper side of the level roof forms the area F to be dewatered. The roof is dewatered in the usual way by water drains (not illustrated here). If, because of heavy rain or a blockage of the regular water drains, a minimum dammed height H is exceeded, the function of an emergency drain device 3 begins, as illustrated schematically in FIG. 1. For this purpose, a drainpipe 4 opens into the area F and, in the exemplary embodiment illustrated, is led by angled pieces into the vicinity of the outer wall 1 in order there, after a certain discharge height, to be led through the outer wall to form a drain 5 on the outside of the outer wall. An emergency drain device 3 is not intended to lead the water into the sewerage system in the usual way, since a main use of the emergency drain devices 3 is heavy rain, by which the sewerage system is already overloaded under certain circumstances, so that a discharge from the area F which is to be dewatered independently of the possibly overloaded sewerage system is intended to be possible. Therefore, water from an emergency drain device 3 is normally discharged freely on the outside of an outer wall 1.

[0029] With its mouth opening in the area F, the drainpipe 4 forms a discharge opening 6. Around the discharge opening 6 and at a considerable distance which is greater than the diameter of the discharge opening 6, a weir 7 is arranged annularly in the discharge opening 6 and, in the exemplary embodiment illustrated in FIG. 1, has a triangular cross section. Beyond the discharge opening and beyond the annular weir 7, a top plate 8 extends radially outward, being formed as a level plate in the exemplary embodiment illustrated. The top plate 8 is arranged at a defined distance A by using spacer bolts 9. The distance A is somewhat greater than the height of the weir 7, which height corresponds to the minimum dammed height H. The minimum dammed height H is more than half, preferably more than two-thirds, of the spacing A between the area F and the underside of the top wall 8.

[0030] FIG. 1 reveals that water dammed up on the area F above the minimum dammed height H, as seen from a mid-axis 10 of the discharge opening 6, must flow radially inward under the top plate 8 and over the weir 7 in order to reach the discharge opening 6. Since the spacing of the annular weir 7 from the mid-axis 10 is chosen to be large and corresponds to at least twice the radius of the discharge opening 6, the nec-

essary large flow is led away through the remaining interspace between weir 7 and the underside of the top plate 8 but in highly calmed form.

[0031] FIGS. 2 and 3 illustrate the emergency drain in a detailed illustration. In particular, it can be seen that the weir 7 has the form of a regular hexagon in plan view and that flow guide webs 11 running radially and projecting into the corners of the hexagon are fitted to the top plate 8, extending from the edge of the discharge opening 6 into the corners of the weir 7. The weir 7 has a triangular cross section with an upstream flank 12 and a downstream flank 13. The downstream flank 13 merges into a flange 14 running radially inward as far as the discharge opening 6, which flange can be referred to as “base” and is used to fix the weir 7 to the area F by means of threaded bolts 15. The relative fixing of the top wall 8 with respect to the flange 14 is made with further spacer bolts 9', with which and also with the spacer bolts 9 the top wall 8 can be fixed at a defined height relative to the area F and relative to the flange 14

[0032] The shape of the top wall 8 is matched to the shape of the weir 7 and extends radially outward with a uniform projection 16 over the outer edge of the weir 7. The sectional illustration of FIG. 2 reveals that the weir 7 itself is open at the bottom, that is to say is not closed off at the bottom with a “base”. The sealing of the weir 7 with respect to the area F is therefore carried out on the underside of the upstream flank 12.

[0033] The triangular configuration of the weir 7 which can be seen in FIGS. 1 and 2 is to be understood as purely exemplary. Because of its ability to be produced easily, it constitutes a preferred embodiment of the invention.

[0034] FIG. 4 shows further exemplary embodiments which are likewise conceivable and advantageous as a cross-sectional shape for the weir 7. FIG. 4 shows three cross-sectional shapes Q1, Q2 and Q3 over which the water present flows in the flow direction S.

[0035] The cross-sectional shape in FIG. 4a constitutes a semicircle. The weir 7 can therefore be produced in a simple way as half a pipe.

[0036] The cross-sectional shapes according to FIGS. 4b and 4c are asymmetrical cross-sectional shapes, the cross section Q2 having a longer upstream flank 12' and a shorter—and therefore steeper—downstream flank 13'. The two flanks are substantially rectilinear and, at the highest point of the cross-sectional shape Q2, merge into each other via a rounded transition piece 17.

[0037] The cross-sectional shape Q3 corresponds to the cross-sectional shape Q2 but mirror-inverted, the upstream flank 12" being shorter and having a greater mean steepness than the downstream flank 13". Here, too, the two substantially level flanks 12", 13" merge into each other at the highest point of the weir 7 by means of a rounded transition piece 17.

[0038] The cross-sectional shapes illustrated hitherto contain a continuous reduction in width of the cross section with increasing height, starting from the area F. This corresponds to the preferred embodiments. However, the present invention does not rule out the case in which, in particular on the downstream flank 13, an undercut 13a is provided, by means of which a projecting nose 13b is formed on the downstream flank. An embodiment of this type, which results as a modification of the cross-sectional shape from FIG. 4b, is illustrated in FIG. 4d.

[0039] Of course, the cross-sectional shapes illustrated are to be understood as purely exemplary. Further cross-sectional

shapes can readily be found by those skilled in the art within the context of the present invention. In particular, the flanks 12, 13, 12', 13', 12", 13" do not have to be formed continuously but can in each case have a large number of steps, with which the height difference from the area F to the highest point of the weir 7 is overcome. Furthermore, the falling flank can also be formed as a vertically upright wall or even be missing entirely. In the latter case, the weir comprises only a metal sheet for the obliquely rising flank 12, which for example can be formed as an annular metal sheet. In this case, the cross section of the weir is, for example, triangular, the falling wall being left out. No relevant difference in flow terms arises from the omission of the wall.

[0040] Although it is preferred for the emergency drain to be formed symmetrically around the discharge opening 6, installation positions are conceivable in which an asymmetrical formation with respect to the mid-axis 10 of the discharge opening 6 both with respect to the weir 7 and also with respect to the top plate 8 appears to be possible and expedient.

1. Emergency drain for dewatering an area (F) accumulating water via a discharge opening (6) connected to a drainpipe (4), with which water dammed up above a minimum dammed height (H) can be led away, having a weir (7) for damming up the water up to the minimum dammed height (H) and a top wall (8) arranged at a distance from the discharge opening (6) to prevent air being sucked into a vortex forming in the discharge opening (6), the weir (7) being arranged around the discharge opening (6) and the top wall (8), as seen from the discharge opening (6), extending as far as the other side of the weir (7), characterized in that the weir (7) has a cross section which, at the base of the weir (7) resting on the area (F), is provided in the flow direction (S) with a substantially greater width than at the highest point of the weir (7) over which the water flows.

2. Emergency drain according to claim 1, characterized in that the weir (7) has a triangular cross section in the flow direction (S).

3. Emergency drain according to claim 1, characterized in that the weir (7) has a semicircular cross section in the flow direction (S).

4. Emergency drain according to claim 1, characterized in that the weir (7) has a symmetrical cross section in the flow direction (S).

5. Emergency drain according to claim 1, characterized in that the weir (7) has an asymmetrical cross section in the flow direction (S) with an upstream flank (12) and a downstream flank (13), the two flanks (12, 13) having an unequal length and mean steepness.

6. Emergency drain according to claim 5, characterized in that the upstream flank (12) has a lower mean steepness.

7. Emergency drain according to claim 1, characterized in that the weir (7) has an upstream flank (12) and a downstream flank (13) which are rectilinear over their entire length.

8. Emergency drain according to claim 1, characterized in that the weir (7) has an upstream flank (12) and a downstream flank (13) and in that the flanks (12, 13) run rectilinearly over part of their length and merge into each other with a rounded intermediate piece (17) toward the highest point.

9. Emergency drain according to claim 1, characterized in that, between the weir (7) and the discharge opening (6), flow guide webs (11) running radially toward a center line (10) of the discharge opening (6) are provided.

10. Emergency drain according to claim 9, characterized in that the flow guide webs (11) extend as far as the top wall (8).

11. Emergency drain according to claims 1, characterized in that the weir (7) is circular in plan view.

12. Emergency drain according to claim 9, characterized in that the weir (7) is formed as a uniform polygon in plan view, and in that the flow guide webs (11) extend in the direction of the corners.

13. Emergency drain according to claim 12, characterized in that the weir (7) is formed as a uniform hexagon in plan view.

14. Emergency drain according to claims 1, characterized in that the height of the weir (7) extends until it is above half the spacing (A) between the area (F) and the top wall (8).

15. Emergency drain according to claim 14, characterized in that the height of the weir (7) extends until it is above two-thirds of the spacing (A) between the area (F) and the top wall (8).

16. Emergency drain according to claim 1, characterized in that the top wall (8) is formed as a level disk.

17. Emergency drain according to claim 1, characterized in that the top wall (8) has the shape of the weir (7) in plan view and thus projects outward uniformly along the weir (7).

18. Emergency drain according to claim 1, characterized in that it is conceived as a non-pressure drain.

* * * * *