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Roof drainage system and process for roof draining

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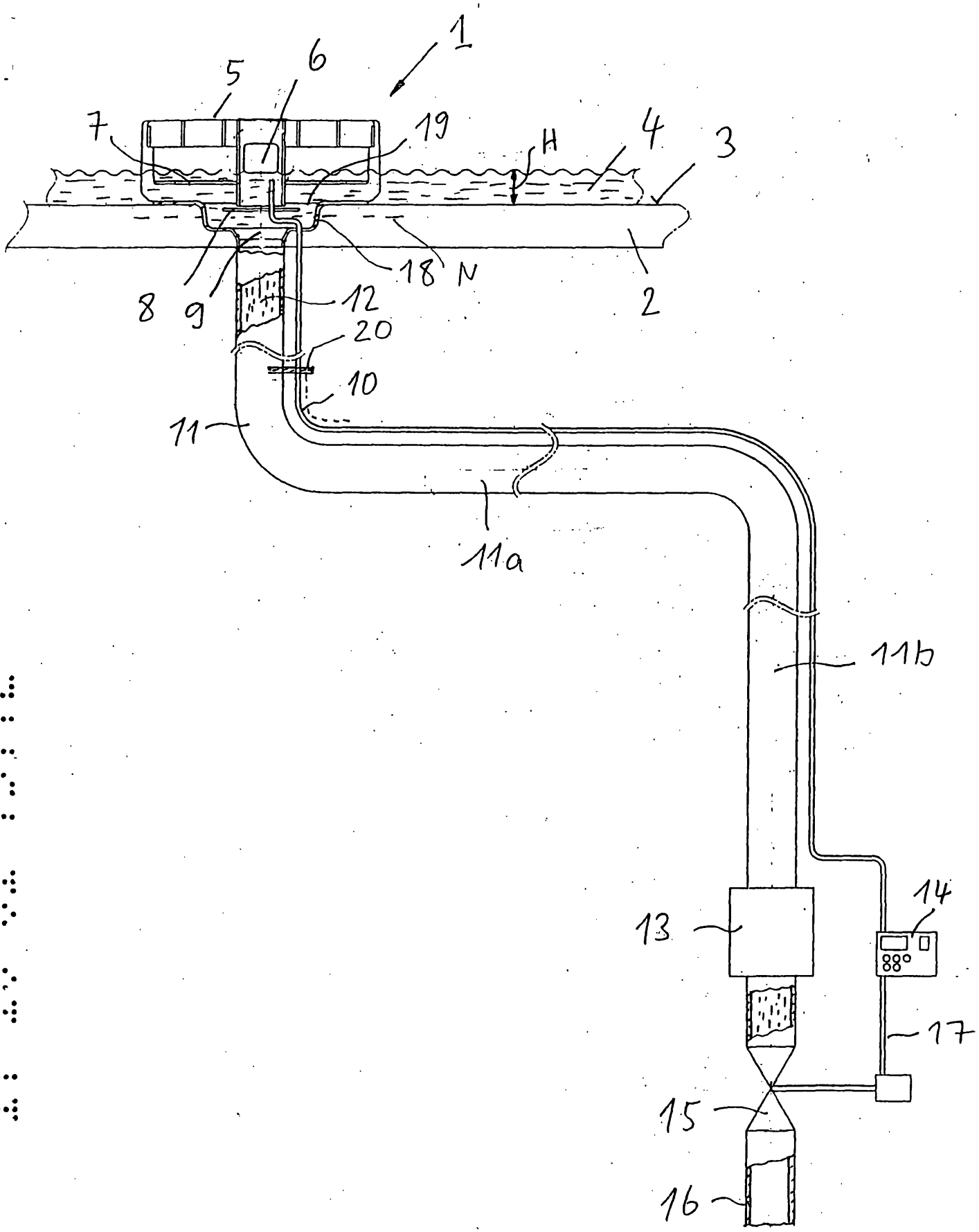
Roof Drainage System and Process for Roof Draining

Abstract

The roof drainage system comprises at least one outflow opening which has a discharge opening (9) and is connected with a discharge pipe (11) at this opening (9). At least part of the discharge pipe (11) is filled with water (12) at all times. A discharge valve (15) is arranged in the discharge pipe (11) in spaced relationship from the outflow opening. The water (12) above this discharge valve (15) forms a water column. A control system (6, 14, 15) is provided with a gauging sensor (6) and keeps the level of filling substantially constant.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COMPLETE SPECIFICATION

FOR A STANDARD PATENT

ORIGINAL

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Invention Title:	Roof Drainage System and Process for Roof Draining

The following statement is a full description of this invention, including the best method of performing it known to me/us:-

Roof Drainage System and Process for Roof Draining

TECHNICAL FIELD

The invention relates to a roof drainage system which has a discharge opening and is provided with a discharge pipe at this opening for the discharge of roof water. The invention also relates to a process for draining of the roof.

BACKGROUND OF THE INVENTION

A roof drainage system of the cited type is known as state of the art from EP 0 681 633 B1 of the Applicant. The same facilitates drainage, particularly of flat roofs, by means of a so-called looped flow. The advantage of such a looped flow results mainly from the fact that the hydraulic capacity is greater than in systems without such a looped flow and that in this way the diameter of the discharge pipe can be reduced. By completely filling the discharge pipe, a negative pressure develops at the upper end of a downpipe and is available to the subsequent horizontal pipes. Owing to the high hydraulic capacity, a plurality of water-collecting troughs can be drained through a single downpipe. A further advantage of the looped flow resides on the fact that the same provides a comparatively low-noise water drainage. It is a problem in this roof-drainage system that dynamic variations and a substantial mechanical load on the pipe system may develop. Furthermore, an even more extensive noise reduction is required for systems with extremly stringent requirements in regard to structural and architectural acoustics. It would be particularly desirable to avoid dripping noise.

SUMMARY OF THE INVENTION

The problem underlying the invention is to create a system of the above-specified type in which the cited shortcomings are avoided and which therefore has less noise and a reduced mechanical load on the pipe system.

In a generic roof drainage system the problem is solved by having at least part of the discharge pipe filled with water at all times. If required, there is at all times a water column in the discharge pipe of the roof drainage system according to the invention. Water which is admitted to this water column from above is discharged at the lower end of the water column. The water column is preferably adjusted so that there the degree of filling is at all times substantially the same. The water volume admitted to the water column then always corresponds to the water volume discharged through the lower end of the water column.

According to a modification of the invention, a discharge valve is arranged in the discharge pipe in spaced relationship from the roof drainage opening and the water forms a water column above this discharge valve. This discharge valve is preferably controlled in such a way that the discharge pipe is practically completely filled above the discharge valve. Thus, in this case the water column extends substantially from the discharge valve to the roof drainage opening. A particularly simple and accurate regulation is ensured when, in accordance with a further modification of the invention, a gauging sensor is arranged in the discharge pipe for monitoring the water column. The water level is determined with this gauging sensor either continually or within short time intervals and the discharge valve is actuated on the basis of this measurement. When the discharge valve is a regulating valve, the level of filling can be adjusted particularly accurately and rapidly.

The process for draining water from the roof works with the aid of a discharge pipe which at an upper end has a roof drainage opening and, spaced therefrom, a discharge valve, with the discharge pipe contgaining a water column above the discharge valve. The water column (12) is adjusted so that it is at all times present with substantially the same height. The principle of this form of regulation implies that when only a small volume of water flows in, an accordingly small volume of water flows out. The mechanical load and the development of noise are in this way minimised. The water column in the discharge pipe prevents any noise due to dripping.

Further advantageous features become obvious from the dependent claims, the ensuing description, and the drawing.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

An embodiment of the invention will be explained by way of the single figure. This figure shows diagrammatically a roof drainage system according to the invention. As illustrated in the figure, a water-collection trough 5 is arranged as roof discharge port on a roof 2, particularly a flat roof, which trough can be configured substantially in accordance with the above-cited EP 0 681 633 B1. However, other embodiments can be envisaged and, more specifically, the system according to the invention can comprise a plurality of wtaer-collection troughs. On the plane of the upper side 3 of the roof 2, water-collection trough 5 has a discharge opening 9 connected to a basin 18 which is inserted in the roof 2 and has the discharge opening 9. A lower plate 8 is arranged above this discharge opening 9 and an upper plate 7 is arranged

above plate 8. These plates 7 and 8 are known and prevent at least to some extent that air is sucked in. These plates 8 and 7 are not indispensable for the invention and can be omitted.

At the lower end of the water-collection trough 5 there is arranged a discharge pipe 11 which runs via a horizontal section 11a and a descending section 11b to a discharge valve 15. This discharge valve 15 is preferably a shut-off valve and regulating valve and is connected via a signal line 17 with control means 14 which is connected through a line 10 with a gauging sensor 6. This gauging sensor 6 is - as shown - arranged preferably in the collection trough 5 and serves for monitoring a water column 12 extending from the discharge valve 15 to the water-collection trough 5. The bottom of the discharge valve 15 is connected to a further water pipe 16 which usually runs to a road gutter. Below the gauging sensor 6 there is arranged a further gauging sensor 20 which is likewise connected to the control means 14. A lower minimum filling level of the water column 12, which is located below the opening 9, can be detected with this second gauging sensor 20.

It is important that the discharge pipe 11 above the discharge valve 15 contains at all times at least a partial water column 12. Prior to the appearance of rain water, the level of this water column 12 is on the level of this inflow opening 19 or below the same. In principle, the level may be situated below the discharge opening 9.

For the purpose of sound absorption, a known deadener 13 can be arranged slightly above the discharge valve 15. The discharge valve 15 is arranged preferably outside the sound absorption area of the deadener 13. Thus, there is at all times a water column 12 in the sound absorption area. The pipe 16, which is arranged below the discharge valve 15 and in which increased noise development can be expected, is therefore outside the sound absorption area.

The working of the roof drainage system 1 will be explained below.

When the roof drainage system 1 is put into operation, the pipe 11 is filled from below with potable water or raw water. Pipe 11 is preferably filled to an extent such that the water level is slightly below the inflow opening 19. Then the gauging sensor 6 is above this level. The standby level N is indicated by a dashed line in the figure.

If, during a rainfall, which may be heavy and sudden, the water level on the roof 2 rises, this rise is detected by gauging sensor 6, and the discharge valve 15 is opened via the control means 14 and, hence, water of the water column 12 is discharged into pipe 16. The water falling on the roof 2 is therefore continually drained via the filled pipe 11. On this occasion the

discharge valve 15 is preferably opened to an extent such that a maximum surface level H is not exceeded. This maximum surface level amounts to, for example, 50 mm. The discharge valve 15 can be adjusted so that the duct is opened in dependence upon the water accumulated on roof 2. When but little water is present and, hence, when the water level rises only slightly, the discharge valve 15 is accordingly opened only slightly, whereas in the case of a substantial rise of the water level, the discharge valve is accordingly opened to a greater extent. Appropriate gauging sensors 6, with which various water levels can be measured very accurately, are known to those skilled in the art.

If, after the arrival of rain water, the level N has been reached again, the discharge valve 15 is closed again via the control means 14. Thus, the water column 12 is kept with the water level N until the next downpour. As explained above, a plurality of water collection troughs 5 can be connected to the pipe 11. It suffices that only one of these water collection troughs 5 is provided with a gauging sensor 6, because all the water collection troughs 5 are connected to the common discharge valve 15. Thus, even a comparatively large roof drainage systems can be controlled with comparatively simple, inexpensive means.

There can also be envisaged a roof drainage system having a plurality of roof inlet or discharge openings 9 which can connect with a common pipe. Each of these inlet openings is preferably provided with at least one sensor 6. In this way increased reliability can be obtained despite unevenness and soiling of the roof. The discharge is regulated in a particularly simple and safe manner using the well-known fuzzy logic.

The claims defining the invention are as follows:

1. A roof drainage system which has a discharge opening (9) and is connected with a discharge pipe (11) at this opening through which water of the roof can be drained, characterised in that at least part of the discharge pipe (11) is filled with water (12) at all times.

2. The system according to Claim 1, characterised in that a discharge valve (15) is arranged in the discharge pipe (11) in spaced relationship from the roof drainage opening and that the water (12) forms a water column above this discharge valve (15).

3. The system according to Claim 1 or 2, characterised in that there is provided a control system which keeps the level of filling with water (12) substantially constant.

4. The system according to any one of Claims 1 to 3, characterised in that a gauging sensor (6) is arranged at an upper end of the discharge pipe (11) for monitoring the water column.

5. The system according to Claim 4, characterised in that the gauging sensor (6) is arranged slightly below the maximum surface level (H).

6. The system according to any one of Claims 1 to 3, characterised in that the discharge valve (15) is a regulating valve.

7. The system according to any one of Claims 1 to 4, characterised in that the discharge valve (15) is arranged outside a sound absorption area (13).

8. The system according to any one of Claims 1 to 5, characterised in that a water collection trough (5) is arranged above the discharge opening (9) and comprises at least one plate (8).

9. The system according to any one of Claims 4 to 8, characterised in that there is provided a plurality of discharge openings (9) and that each of the drainage openings is provided with a gauging sensor (6).

10. The system according to any one of Claims 4 to 8, characterised in that a second gauging sensor (20) is provided for detecting a minimum level of filling.

11. The system according to any one of Claims 2 to 10, characterised in that the discharge valve (15) is a bewllos valve.

12. Process for roof draining by means of a discharge pipe (11) which has a discharge opening (9) at an upper end and, spaced therefrom, a discharge valve (15), wherein the discharge pipe (11) contains a water column (12) above the discharge valve (15), characterised in that the water column (12) is adjusted so that it is at all times present with substantially the same height.

13. The process according to Claim 9, characterised in that the height of the water column (12) is monitored by means of a gauging sensor (6).

14. The process according to Claim 12 or 13, characterised in that the control system (6, 14, 15) controls the rain water outflow in accordance with fuzzy logic.

15. A roof drainage system substantially as hereinbefore described with reference to the accompanying drawing.

16. A process for roof draining, the process substantially as hereinbefore described with reference to the accompanying drawing.

Dated 10 October, 2001

Geberit Technik AG

Patent Attorneys for the Applicant/Nominated Person

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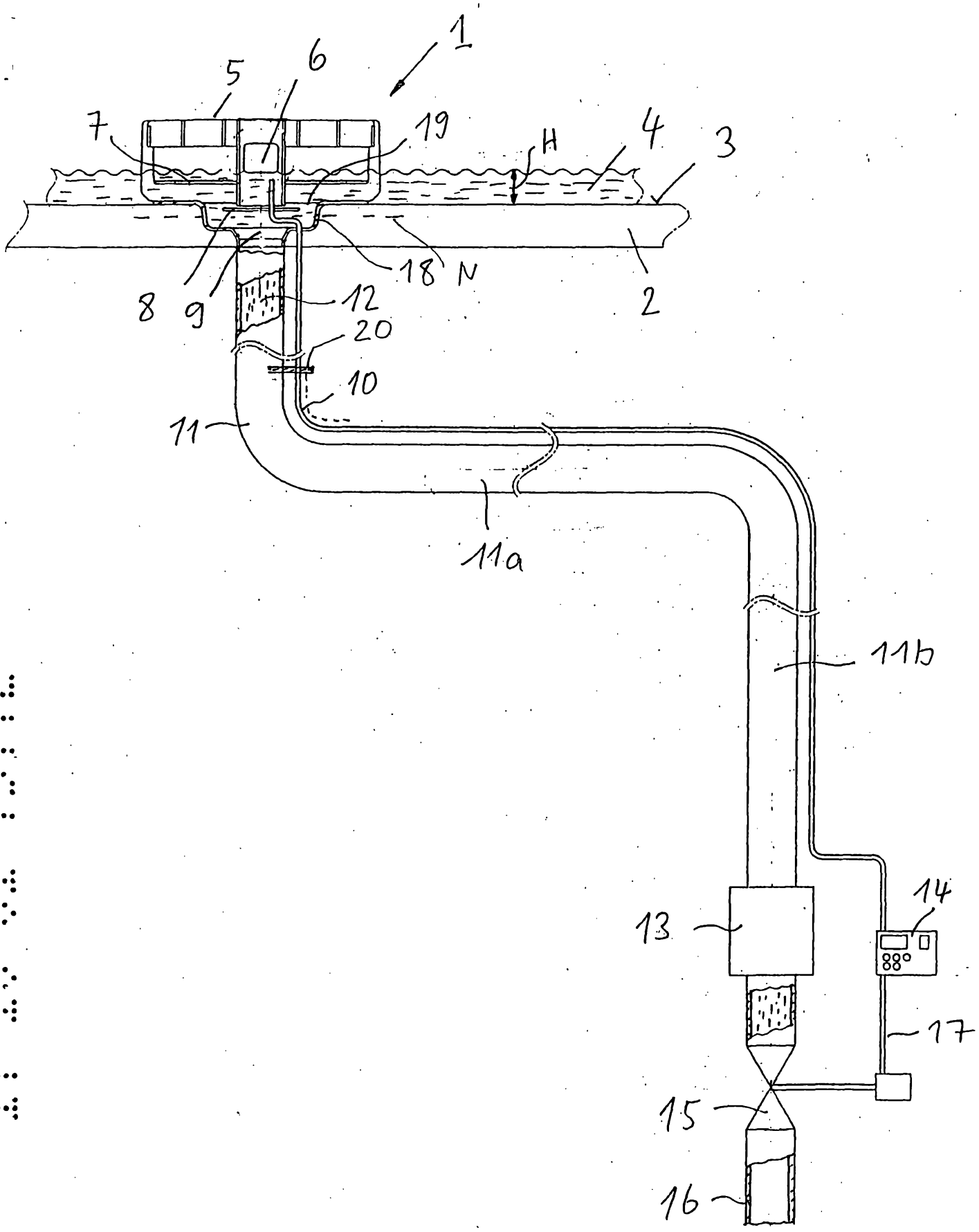
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