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(54) **FLOOD PROTECTION DEVICE**
RÜCKFLUSSVERHINDERER
DISPOSITIF ANTI-RETOUR

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Description

Field of invention

[0001] The present invention relates to flood protection device configured to prevent water ingress through a pipe member such as a drain or a toilet.

Prior art

[0002] Water ingress through pipe systems is a major problem. Accordingly, several water damage protection systems have been developed in order to protect against costly water damage. Water leaks are not always easy to notice and furthermore, by the time people realize that their pipe is leaking, a major damage may already be done.

[0003] A typical prior art flood protection device is configured to be installed in an invasive way, e.g. installing a sewer valve into a pipe system.

[0004] US 4494345 A discloses a sewer valve that is configured to prevent back flow of sewage into a structure during abnormally high water conditions. The sewer back flow valve comprises sensing means located at the top of the sewer line and an inflatable annular bladder responsive to a sensing means to permit passage of sewage through the annular bladder under normal water level conditions and operable to prevent back flow of sewage through the annular bladder under high water level conditions. The sewer valve is however, not suitable for being used in pipe systems as such. The sewer valve has to be installed in an invasive manner which means that bores and/or cuttings have to be provided in the pipe systems. Accordingly, installation of such system is irreversible, expensive and requires skilled personal.

[0005] GB 2480885 A discloses a flood protection device for preventing water ingress through a sewer pipe connecting a building to a sewer main. The flood protection device comprises a valve engageable with a sewer pipe which, when closed, effects blockage of said sewer pipe. The flood protection device moreover comprises a valve actuation mechanism responsive to water contact. The valve actuation mechanism is configured to close the valve upon contact with water. The valve actuation mechanism includes an inflatable bladder configured to, upon inflation, effect closure of the valve. The flood protection device also comprises means for inflating gas into the inflatable bladder.

[0006] Unfortunately, this flood protection device has to be installed in an invasive manner which means that bores and/or cuttings have to be provided in the pipe systems. Thus, installation of such flood protection device irreversible, expensive and requires skilled personal.

[0007] US 20110005615 A1 discloses a fluid backup preventing system capable of blocking a pipeline. The fluid backup preventing system is intended for being arranged in a clean out duct provided at the pipe-line in-

tended to be blocked. Moreover, the fluid blocking system is pneumatically coupled to an external pneumatic circuitry arranged outside the pipeline.

[0008] US 4417598 A discloses a pneumatic valve system intended to seal of the flow of a liquid. The pneumatic valve system is connected to an external pressure source (air compressor).

[0009] GB2480005A shows a gas cartridge with Carbon Dioxide or Nitrogen, which is used to inflate an inflatable bladder for the prevention of ingress of rising floodwater.

[0010] Thus, there is a need for a flood protection device which reduces or even eliminates the above mentioned disadvantages of the prior art. It is an object of the present invention to provide a flood protection device that is configured to prevent water ingress through a pipe member and that does not require an external pressure source.

[0011] It is a further object of the present invention to provide a flood protection device that can be arranged in pipe systems in a non-invasive way and that is capable of preventing water ingress through a pipe member.

[0012] It is also an object of the present invention to provide a flood protection device that requires no batteries or electricity.

[0013] It is also an object of the present invention to provide a flood protection device that can easily be arranged in and be removed from a pipe system.

Summary of the invention

[0014] The object of the present invention can be achieved by a flood protection device as defined in claim 1. Preferred embodiments are defined in the dependent sub claims and explained in the following description and illustrated in the accompanying drawings.

[0015] The flood protection device according to the invention is a flood protection device configured to prevent water ingress through a pipe member, which flood protection device comprises:

- a blocking member for use in the pipe member of the pipe system, wherein the blocking member is an inflatable member,
- an actuation device,
- an actuation device configured to inflate the inflatable member whereby the inflatable member is configured to block the pipe member,
- an actuation mechanism operable upon contact with water or manually, wherein the actuation mechanism is configured to activate the actuation device and hereby make the blocking member block the pipe member of the pipe system wherein the flood protection device is configured to be arranged in the pipe member and to be removed from the pipe member without damaging the pipe member and with no structural change of the pipe system. No cutting, drilling or other invasive procedure is required in order

to arrange the flood protection device in the pipe member.

[0016] According to the invention, the actuation device is a gas cartridge comprising compressed gas such as Carbon Dioxide or Nitrogen whereby the gas cartridge is arranged within a surrounding inflatable balloon member.

[0017] Hereby, it is achieved that the gas cartridge can provide a fast and efficient filling of the inflatable member (e.g. a balloon member) and a compact flood protection device can be achieved. Furthermore, the gas cartridge can be protected against impact while being arranged in the pipe member during the positioning process.

[0018] Further, the flood protection device can be arranged in a pipe member without being connected to an external pressure source. Further, the pipe member does not need to be modified and that no clean out duct is needed to install the flood protection device. Moreover, the flood protection device can be arranged in pipe member in a non-invasive way and still prevent water ingress through a pipe member. The flood protection device can easily be arranged in and be removed from a pipe system.

[0019] The term "without damaging" means that no structural change of the pipe system is required. This means that no cutting, drilling or other invasive procedure is required in order to arrange the flood protection device in the pipe member.

[0020] Hereby a quick, efficient and reliable blocking of a pipe member can be achieved.

[0021] Also, a very efficient and reliable way of blocking a pipe member can be provided.

[0022] Moreover, the inflatable balloon member is able to block pipe members of various geometry and sizes.

[0023] Also, an efficient and reliable blocking member configured to block pipe member is achieved.

[0024] An inflatable balloon member provides a very flexible blocking means that also provides a large contact surface (blocking surface) between the inflatable balloon member and the pipe member. Hereby an effective blockage can be achieved. Moreover, an inflatable balloon member allows particles and objects in sewage water to be enclosed by the inflatable balloon member.

[0025] It may be an advantage that the blocking member is mechanical and therefore requires no electricity (and hence no battery or connection to the mains is required).

[0026] As long as the actuation mechanism is configured to activate the actuation device and hereby make the blocking member block the pipe member, the actuation mechanism may be any suitable actuation mechanism operable upon contact with water.

[0027] The actuation mechanism may be a unit comprising several other members or a unit connected to other members. The actuation mechanism is responsible for controlling the flood protection device.

[0028] The flood protection device is configured to be arranged in the pipe member and be removed from the pipe member without damaging the pipe member. This

means that the flood protection device can be arranged in a pipe member in a non-invasive way so that the flood protection device can be removed or replaced when desired.

[0029] This is a major advantage compared to the prior art flood protection devices. Money, time and inconvenience can be saved by using a flood protection device according to the invention.

[0030] It may be an advantage that the flood protection device comprises a string member configured to guide the flood protection device into a desired position within a pipe member.

[0031] Hereby it is achieved that the flood protection device can be positioned in pipe systems comprising a bending and another challenging structure.

[0032] The string member may be made in metal or plastic so that the required stiffness is provided. At the same time a metal string member will allow the string member to be bent if required. The cross section of the string member may be circular, oval, square, rectangular or have any other suitable geometry.

[0033] Advantageously, the flood protection device comprises an unblocking member mechanically connected to the string member, where the unblocking member is configured to unblock the blocking member from blocking the pipe member when pulling or pushing the string member. It may be an advantage that the string member comprises an inner string member slidably arranged within an outer string member formed as a pipe. Hereby it is possible both to pull the flood protection device with the outer string member and to pull the flood protection device by using the inner string member by way of example. This may in particular be beneficial in embodiments of the invention, in which the string member is required to be configured to unblock the blocking member.

[0034] It may be an advantage that the flood protection device comprises a water detection member configured to activate the actuation device and hereby make the blocking member block the pipe member.

[0035] Hereby the presence of water can be detected and thus the actuation device of the flood protection device can be activated in order to make the blocking member block the pipe member as soon as water is detected by the water detection member.

[0036] It may be beneficial that the flood protection device comprises an electric water detection member.

[0037] It may be an advantage that the flood protection device comprises a water detection member arranged in the space of a shield member having an inner layer and an outer layer, and that the shield member is provided with one or more apertures configured to evacuate air or gas from the space of a shield member, and that the shield member is configured to allow water to enter the space between the inner layer and the outer layer through one or more apertures in the outer layer and to be discharged through one or more apertures in the outer layer, and that the shield member is configured in such a way that water will enter the shield member through one or

more apertures in the shield member and make the water detection member wet when the shield member is submerged in water.

[0038] Hereby it is achieved that the flood protection device can be placed in a pipe member with water flowing activating the blocking member and hereby blocking the pipe member. At the same time the flood protection device is capable of blocking the pipe member when water enters into the shield member when the flood protection device is submerged into water (e.g. in case of water ingress through the pipe member). The flood protection device will be activated only when submerged in water regardless of the direction of the flow.

[0039] It may be an advantage that the water detection member is a compound (e.g. a tablet) that is plugging a connection member (e.g. a pipe) while the water detection member is kept dry, where the water detection member is configured to be dissolved or react upon contact with water.

[0040] Hereby, a cheap, efficient and reliable water detection member can be achieved.

[0041] It may be an advantage that the inflatable balloon member is provided with at skid-proof outer layer making the inflatable balloon member suitable for blocking pipe member with a slippery inner surface.

[0042] It may be an advantage that the flood protection device is configured to be activated by external means e.g. a remote control.

[0043] Hereby it would be possible to activate and/or test the flood protection device if required.

[0044] The flood protection device according to the invention may be scaled in order to fit into pipe members of various sizes.

Description of the Drawings

[0045] The invention will become more fully understood from the detailed description given herein below. The accompanying drawings are given by way of illustration only, and thus, they are not limitative of the present invention. In the accompanying drawings, the invention according to which the cartridge is provided within the surrounding inflatable balloon member, is not shown. Therefore, in the accompanying drawings:

- Fig. 1 shows a schematic view of a flood protection device;
- Fig. 2 shows perspective cross-sectional view of a flood protection device arranged in a pipe member;
- Fig. 3 shows other views of the flood protection device shown in Fig. 2;
- Fig. 4 shows a cross-sectional view of a flood protection device arranged in a drain;
- Fig. 5 shows a flood protection device arranged in a toilet;
- Fig. 6 shows a flood protection device arranged in a drain;

Fig. 7 shows a cut-away view of a pipe in which a flood protection device is arranged;

Fig. 8 shows another schematic view of the flood protection device shown in Fig. 1 and

5 Fig. 9 shows an alternative flood protection device to a device shown in Fig. 4.

Detailed description of the invention

10 **[0046]** It is referred in detail to the drawings for the purpose of illustrating a flood protection device.

[0047] Fig. 1 is a schematic side view of a flood protection device 2. The flood protection device 2 comprises an inflatable member 4 shaped as an inflatable balloon 4 (also known as a bladder) that is in fluid communication with a gas cartridge 6 (e.g. compressed gas such as Carbon Dioxide or Nitrogen). The flood protection device 2 moreover comprises an activation mechanism 8 having a water detection member 10 arranged centrally in a spherical double layered shield member 12.

[0048] The water detection member 10 is configured to activate the activation mechanism 8 when the water detection member 10 is in contact with water. The water detection member 10 may be an electronic water detection member or a chemical compound (e.g. a tablet) that is dissolved when being brought into contact with water.

[0049] A metal or plastic string member 22 is attached to the activation mechanism 8 of the flood protection device 2. The string member 22 is configured to be used to position and attached the flood protection device 2 in e.g. a drain (see Fig. 4 or Fig. 6) or a toilet (see Fig. 5). The string member 22 can preferably be made in metal or another material that is stiff enough to push the flood protection device 2 through a bending (e.g. in a pipe bending) and flexible enough to allow for the required bending of the string member 22 during positioning the flood protection device 2.

[0050] Fig 1. b) illustrates a close-up view of the shield member 12 shown in Fig. 1 a). The shield member 12 is basically spherical and comprises an inner layer 14 arranged within an outer layer 16. The water detection member 10 is symbolised by a black spherical. A vent aperture 28 is provided in the top region of the inner layer 14 of the shield member 12. The vent aperture 28 is configured to vent the shield member 12 (so that air housed in the shield member 12 can be evacuated when water enters the shield member 12).

[0051] Water drops 50 may enter the shield member 12 through apertures 20 provided in the outer layer 16. The water drops 50 will then stream down the outside surface of the inner layer 14. Eventually, the water drops 50 will leave the space between the inner layer 14 and the outer layer 16 through apertures 18. Accordingly, water drops 50 as illustrated in Fig. 1 b) will not activate the activation mechanism 8. Therefore, the flood protection device 2 may be placed in a pipe, a drain or in a toilet without being activated by water entering through the apertures 20 provided in the outer layer 16. This means that

when the water is flowing freely during normal function, the flood protection device 2 will not be activated.

[0052] However, when the shield member 12 is submerged in water, the water will enter the space 32 within the inner layer 14 through the lower apertures 26 in the inner layer 14. Hereby the air housed in the space 32 within the inner layer 14 will be evacuated through the vent aperture 28 and further through the upper apertures 20 in the outer layer 16.

[0053] When the shield member 12 is submerged into water, the air housed in the space 32 within the inner layer 14 will gradually be evacuated through the vent aperture 28 and further through the upper apertures 20 in the outer layer 16 until all the air in the space 32 within the inner layer 14 is displaced by the water entering the space 32 within the inner layer 14 through the lower apertures 26 in the inner layer 14. Accordingly, the water detection member 10 will be wet and hence actuate the activation mechanism 8 that will cause the balloon 4 to be inflated by gas from the gas cartridge 6. Hereby, the balloon 4 will block the pipe, drain or toilet into which the flood protection device 2 is arranged. Hereby flood will be avoided.

[0054] It is preferred that the activation mechanism 8 is configured in such a way that the string member 22 can be used to initiate an evacuation of the balloon 4 by pulling the string member 22. It is possible to provide the activation mechanism 8 with a build-in (e.g. mechanical) valve mechanism (not shown) configured to be activated by pulling the string member 22. Hereby, it is possible to remove the flood protection device 2 in an easy way by pulling the string member 22 while evacuating the balloon 4.

[0055] Fig. 2 a) illustrates a perspective cross-sectional view of a flood protection device 2 arranged in a pipe member 24. The flood protection device 2 is seen from its distal end. It can be seen that the flood protection device 2 comprises an inflatable rubber balloon 4.

[0056] In Fig. 2 b) the flood protection device 2 shown in Fig. 2 a) is seen in a state in which the flood protection device 2 has been activated. It can be seen that the inflatable rubber balloon 4 has been inflated. Accordingly, the balloon 4 will block the pipe member 24 and therefore, the water has no longer access through the pipe member 24 and flood damages will be avoided.

[0057] Fig. 2 c) illustrates a perspective cross-sectional view of the flood protection device 2 shown in Fig. 2 a) seen from the opposite side (where the string member 22 is attached). It can be seen that the flood protection device 2 comprises a string member 22 that is mechanically attached to an activation mechanism 8. Even though not shown, it is preferred that the flood protection device 2 comprises an activation mechanism that is configured in such a way that the string member 22 can be used to initiate an evacuation of the balloon 4 by pulling the string member 22 or inflate by pressurizing through the string member 22 (that may be formed as a pipe like illustrated in Fig. 9).

[0058] Fig. 2 d) illustrates a perspective cross-sectional view of the flood protection device 2 shown in Fig. 2 c) in a state in which the balloon 4 has been inflated. Hence, the pipe member 24 is blocked by the balloon 4 corresponding to the situation shown in Fig. 2 b).

[0059] Fig. 3 a) illustrates a perspective view of a flood protection device 2 shown in Fig. 2. The flood protection device 2 comprises an activation mechanism 8 arranged within and surrounded by a cylindrical balloon member 4. A metal string member 22 is attached to the activation mechanism 8.

[0060] Fig. 3 b) illustrates a cross-sectional view of the flood protection device 2 centrally arranged in a pipe member 24. The balloon member 4 is in a compressed state. However, in Fig. 3 c) the balloon member 4 is inflated and thus the balloon member 4 blocks the pipe member 24.

[0061] In Fig. 4 illustrates a cross-sectional view of a flood protection device 2 arranged in a waste pipe 36. A grating 34 is arranged on the top of the draining frame 52 that is arranged on a waste pipe 36. The flood protection device 2 has a string member 22 that is attached to an indentation 42 by means of a screw 40 that is screwed into a threaded bore in the grating 34 having a number of openings.

[0062] Fig. 4b) illustrates a close-up view of the central portion of the grating 34. The string member 22 of the flood protection device 2 detachable mounted to the grating 34. This means that the flood protection device 2 can be easily detached from the grating 34 in case of replacement of the flood protection device 2.

[0063] Fig. 4 c) illustrates a close-up view of the flood protection device 2 shown in Fig. 4 a) in a state in which the balloon member 4 has been inflated. Accordingly, the balloon member 4 blocks the waste pipe 36. It can be seen that the region of the waste pipe 36 below the balloon member 4 is filled with water 44. Therefore, the flood protection device 2 has prevented water ingress through the waste pipe 36.

[0064] The flood protection device 2 is configured to automatically inflate the balloon member 4 and hereby block the waste pipe 36 when the water detection member (not shown) of the flood protection device 2 becomes wet. Therefore, the balloon member 4 is inflated when the rising water 44 in the waste pipe 36 gets into contact with the water detection member (not shown) of the flood protection device 2.

[0065] It should be underlined that the string member 22 may be attached to the grating 34 simply by applying a hook or bending the string member 22 and hereby attaching the string member to the grating 34 like shown in Fig. 9.

[0066] Fig. 5 illustrates a flood protection device 2 being arranged in a toilet 46. In Fig. 5 a) the flood protection device 2 is being prepared to be arranged in the lower region of the toilet 46. The string member 22 of the flood protection device 2 is flexible so that the flood protection device 2 can enter the pipe system of the toilet 46. In Fig.

5 b) the flood protection device 2 has been arranged in the main pipe of the toilet 46. The distal end of the string member 22 is detachable attached to the toilet 46 by means of a wedge 48. It is important to underline that the string member 22 may be attached to the toilet 46 by other means. It is preferred that the string member 22 is attached to the toilet 46 in a manner that allows for easy and fast replacement of the flood protection device 2.

[0067] The balloon member 4 is provided with a string member 22, by means of which it is possible to evacuate the gas in the balloon member 4 simply by pulling the string member 22. Accordingly, the flood protection device 2 can be removed by pulling the string member 22 first in order to evacuate the gas (e.g. air) in the balloon member 4 and hereafter by pulling the flood protection device 2 out of the toilet 46. It is preferred that the string member 22 is made in a stiff material e.g. metal that makes it possible to push the flood protection device 2 into the pipe system of e.g. a toilet like illustrated in Fig. 5.

[0068] In Fig. 5 c) the balloon member 4 of the flood protection device 2 has been inflated and blocks the water 44 in the lower region of the pipe system and the flood protection device 2 prevents the water 44 from rising further. Hereby the flood protection device 2 prevents water ingress through the pipe system of the toilet 46.

[0069] Fig. 6 illustrates a flood protection device 2 arranged in a waste pipe 36 of a drain comprising a grating 34 that is arranged on the top of and received by a corresponding draining frame 52. The flood protection device 2 comprises a long thin string member 22 that is detachable attached to the centre of the grating 34 by means of a hook 72. Accordingly, the flood protection device 2 can easily be removed from the drain by removing the hook 72 from the grating 34.

[0070] The flood protection device 2 is arranged in the waste pipe 36 and therefore it is configured to prevent water ingress through the waste pipe system 36.

[0071] Fig. 7 illustrates a cut-away view of a pipe 54 in which a flood protection device 2 is arranged. The pipe 54 is connected to a pipe 58 having an opening 60, through which there is access to the pipe 54. The string member 22 of the flood protection device 2 can be used to push the flood protection device 2 into the desired position within the pipe 54. The inflatable balloon member 4 of the flood protection device 2 can be seen through the cut away 56 in the pipe 54. The string member 22 can easily be detachable attached to the pipe 58 e.g. by bending the string member 22 around the pipe 54 (not shown). The flood protection device 2 is suitable for being detachable mounted in various types of pipe systems even pipe systems having challenging structures such as bending.

[0072] Accordingly, the flood protection device 2 can be detachable mounted and prevent water ingress through various pipe systems.

[0073] Fig. 8 a) illustrates another schematic view of the flood protection device 2 shown in Fig. 1 a). The flood protection device 2 comprises an inflatable member 4

shaped as an inflatable balloon 4 being in fluid communication with a gas cartridge 6 that comprises compressed gas (e.g. Carbon Dioxide or Nitrogen). The interior of the activation mechanism 8 is indicated. It can be seen that the gas from the gas cartridge 6 can flow through a number of gas flow lines 68, 68', 68", 68'''. The gas from the gas cartridge 6 can flow into the housing of the activation mechanism 8 via a first gas flow line 68'.

[0074] A water detection member 10 arranged centrally in a spherical double layered shield member 12 prevents the gas from getting access to the central portion of the housing of the activation mechanism 8 via a second gas flow line 68'. When the water detection member 10 (e.g. a water-soluble tablet) is exposed to water, the water detection member 10 will no longer 12 prevents the gas from the gas cartridge 6 from getting access to the central portion of the housing of the activation mechanism 8 via a second gas flow line 68'.

[0075] Accordingly, when the water detection member 10 is exposed to water the gas from the gas cartridge 6 will flow into the inflatable balloon 4 via the first gas flow line 68 to the second gas flow line 68' and further to the third gas flow line 68". A valve member 66 comprising a spring member 62 and a ball member 64 is arranged within the housing of the activation mechanism 8.

[0076] The valve 66 is configured to let out gas in case that a high pressure is built up in the inflatable balloon 4. If a high pressure builds up in the inflatable balloon 4, the pressure causes the ball member 64 to compress the spring member 62 and hereby the gas is allowed to escape out of the housing of the activation mechanism 8 via the fourth gas flow line 68'''.

[0077] The flood protection device 2 comprises a string member 22 that can be used to degas the inflatable balloon 4. Degasing of the inflatable balloon 4 is done simply by pulling the string member 22 so that the spring member 62 is moved upwardly. Hereby the ball member 64 will no longer be pressed against the valve mouth 70. Accordingly, the gas from the inflatable balloon 4 will be degassed through the third gas flow line 68" and the fourth gas flow line 68'''.

[0078] It is preferred that the gas cartridge 6 comprises just enough gas to inflate the inflatable balloon 4. Hereby it is achieved that the inflatable balloon 4 can be degassed at the moment the string member 22 moves the spring member 62 upwards. If the gas cartridge 6 comprises much more gas than it is required to inflate the inflatable balloon 4, the pressure from the gas in the gas cartridge 6 will continue to keep the inflatable balloon 4 inflated until the pressure within the gas cartridge 6 is reduced to a level that allows the inflatable balloon 4 to be emptied via the valve 66.

[0079] Fig. 8 b) illustrates another close-up view of the shield member 12 shown in Fig. 1 b). The shield member 12 is turned upside down and comprises an inner layer 14 arranged within an outer layer 16.

[0080] It can be seen that water drops 50 entering the shield member 12 will leave the shield member 12

through the openings 20, 28 in the inner layer 14 and the outer layer 16 of the shield member 12.

[0081] Therefore, water drops 50 as illustrated in Fig. 8 b) will not activate the activation mechanism 8. Hence, the flood protection device 2 may be placed in a pipe, a drain or in a toilet without being activated by water entering through the apertures 18, 26 provided in the inner layer 14 and the outer layer 16 of the shield member 12.

[0082] In order to activate the activation mechanism 8 it is required that the shield member 12 is submerged into water. When the shield member 12 is submerged into water, the water will enter the space 32 within the inner layer 14 through the apertures in the apertures 20, 28 provided in the inner layer 14 and the outer layer 16 of the shield member 12. The air housed in the space 32 within the inner layer 14 will gradually be evacuated through the apertures 18, 26 until all the air in the space 32 within the inner layer 14 is displaced by the water entering the space 32.

[0083] Accordingly, the water detection member 10 will be wet and hence actuate the activation mechanism 8 that will cause the balloon 4 to be inflated by gas from the gas cartridge 6. Hereby, the balloon 4 will block the pipe, drain or toilet into which the flood protection device 2 is arranged. Hereby flood can be avoided.

[0084] Fig. 9 a) illustrates a flood protection device 2 almost similar to the one shown in Fig. 4 a). The flood protection device 2 is, however, attached to the grating 34 by means of a hook 72.

[0085] Fig. 9 b) illustrates another flood protection device 2. The flood protection device 2 is configured to be manually inflated. A gas cartridge 6 is attached to the distal end of a string member 22 shaped as a pipe. Hereby an inflatable member 4 of the flood protection device 2 can be manually inflated in order to block the waste pipe 36.

List of reference numerals

[0086]

2 - Flood protection device

4 - Inflatable member

6 - Inflation member

8 - Actuation mechanism

10 - Water detection member

12 - Shield member

14 - Inner layer

16 - Outer layer

18 - Aperture

20 - Aperture

22 - String member

5 24 - Pipe member

26 - Aperture

28 - Vent aperture

10 30 - Piping

32 - Space

15 34 - Grating

36 - Waste pipe

38 - Opening

20 40 - Screw

42 - Groove

25 44 - Water

46 - Toilet

48 - Wedge

30 50 - Drop

52 - Draining frame

35 54 - Pipe

56 - Cut away

58 - Pipe

40 60 - Opening

62 - Spring member

45 64 - Ball member

66 - Valve

68, 68' - Gas flow line

50 68, 68' - Gas flow line

70 - Valve mouth

55 72 - Hook

Claims

1. A flood protection device (2) configured to prevent water ingress through a pipe member (24) of a pipe system, which flood protection device (2) comprises:
 - a blocking member for use in the pipe member (24) of the pipe system, wherein the blocking member is an inflatable member
 - an actuation device configured to inflate the inflatable member whereby the inflatable member is configured to block the pipe member (24),
 - an actuation mechanism (8) operable upon contact with water (44) or manually, wherein the actuation mechanism (8) is configured to activate the actuation device and hereby make the blocking member block the pipe member (24) of the pipe system, wherein the flood protection device (2) is further configured to be arranged in the pipe member (24) and be removed from the pipe member (24) with no structural change of the pipe member (24), **characterised in that** the actuation device is a gas cartridge (6) comprising compressed gas such as Carbon Dioxide or Nitrogen for inflating the inflatable member, and **in that** the inflatable member is an inflatable balloon member (4), whereby the gas cartridge (6) is arranged within the surrounding inflatable balloon member (4).
2. A flood protection device (2) according to claim 1, **characterised in that** the flood protection device (2) comprises a string member (22) configured to guide the flood protection device (2) into a desired position within a pipe member (24).
3. A flood protection device (2) according to claim 2, **characterised in that** the flood protection device (2) comprises an unblocking member mechanically connected to the string member (22), where the unblocking member is configured to unblock the blocking member from blocking the pipe member (24) when pulling or pushing the string member (22).
4. A flood protection device (2) according to one of the preceding claims, **characterised in that** the flood protection device (2) comprises a water detection member (10) configured to activate the actuation device and hereby make the blocking member block the pipe member (24).
5. A flood protection device (2) according to claim 4, **characterised in that** the flood protection device (2) comprises the water detection member (10) arranged in the space (32) of a shield member (12) having an inner layer (14) and an outer layer (16), and that the shield member (12) is provided with one or more apertures (28, 20) configured to evacuate

air or gas from the space (32) of a shield member (12), and that the shield member (12) is configured to allow water to enter the space between the inner layer (14) and the outer layer (16) through one or more apertures (20) in the outer layer (16) and to be discharged through one or more apertures (18) in the outer layer (16), and that the shield member (12) is configured in such a way that water (44) will enter the shield member (12) through one or more apertures (18, 26) in the shield member and make the water detection member (10) wet when the shield member (12) is submerged in water (44).

6. A flood protection device (2) according to one of the preceding claims 4 or 5, **characterised in that** the water detection member (10) is a compound that is plugging a connection member (30) while the water detection member (10) is kept dry, where the water detection member (10) is configured to be dissolved upon contact with water (44).
7. A flood protection device (2) according to one of the preceding claims, **characterised in that** the flood protection device (2) is configured to be activated by external means.

Patentansprüche

1. Überschwemmungsschutzvorrichtung (2), die konfiguriert ist, um Wassereintritt durch ein Rohrelement (24) eines Rohrsystems zu verhindern, wobei die Überschwemmungsschutzvorrichtung (2) Folgendes umfasst:
 - ein Blockierelement zur Verwendung in dem Rohrelement (24) des Rohrsystems, wobei das Blockierelement ein aufblasbares Element ist,
 - eine Betätigungsvorrichtung, die konfiguriert ist, um das aufblasbare Element aufzublasen, wodurch das aufblasbare Element konfiguriert ist, um das Rohrelement (24) zu blockieren, ein Betätigungsmechanismus (8), der bei Kontakt mit Wasser (44) oder manuell betrieben werden kann, wobei der Betätigungsmechanismus (8) konfiguriert ist, um die Betätigungsvorrichtung zu aktivieren und dadurch zu verursachen, dass das Blockierelement das Rohrelement (24) des Rohrsystems blockiert, wobei die Überschwemmungsschutzvorrichtung (2) ferner konfiguriert ist, um in dem Rohrelement (24) angeordnet zu sein und aus dem Rohrelement (24) ohne Strukturveränderung des Rohrelements (24) entfernt zu werden, **dadurch gekennzeichnet, dass** die Betätigungsvorrichtung eine Gaskartusche (6) ist, umfassend Druckgas wie z. B. Kohlendioxid oder

- Stickstoff, zum Aufblasen des aufblasbaren Elements, und dadurch, dass das aufblasbare Element ein aufblasbares Ballonelement (4) ist, wobei die Gaskartusche (6) in dem umgebenden aufblasbaren Ballonelement (4) angeordnet ist.
2. Überschwemmungsschutzvorrichtung (2) nach Anspruch 1, **dadurch gekennzeichnet, dass** die Überschwemmungsschutzvorrichtung (2) ein Strangelement (22) umfasst, das konfiguriert ist, um die Überschwemmungsschutzvorrichtung (2) in eine gewünschte Position in einem Rohrelement (24) zu führen.
 3. Überschwemmungsschutzvorrichtung (2) nach Anspruch 2, **dadurch gekennzeichnet, dass** die Überschwemmungsschutzvorrichtung (2) ein Freigabeelement umfasst, das mechanisch mit dem Strangelement (22) verbunden ist, wobei das Freigabeelement konfiguriert ist, um das Blockierelement vom Blockieren des Rohrelements (24) freizugeben, wenn das Strangelement (22) gezogen oder gedrückt wird.
 4. Überschwemmungsschutzvorrichtung (2) nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Überschwemmungsschutzvorrichtung (2) ein Wassererfassungselement (10) umfasst, das konfiguriert ist, um die Betätigungsvorrichtung zu aktivieren und dadurch zu verursachen, dass das Blockierelement das Rohrelement (24) blockiert.
 5. Überschwemmungsschutzvorrichtung (2) nach Anspruch 4, **dadurch gekennzeichnet, dass** die Überschwemmungsschutzvorrichtung (2) das Wassererfassungselement (10) umfasst, das in dem Raum (32) eines Abschirmelements (12) mit einer Innenschicht (14) und einer Außenschicht (16) angeordnet ist, und dass das Abschirmelement (12) mit einer oder mehreren Öffnungen (28, 20) bereitgestellt ist, die konfiguriert sind, um Luft oder Gas aus dem Raum (32) eines Abschirmelements (12) zu evakuieren, und dass das Abschirmelement (12) konfiguriert ist, um zuzulassen, dass Wasser in den Raum zwischen der Innenschicht (14) und der Außenschicht (16) durch eine oder mehrere Öffnungen (20) in der Außenschicht (16) eintritt und durch eine oder mehrere Öffnungen (18) in der Außenschicht (16) abgelassen wird, und dass das Abschirmelement (12) auf solche Weise konfiguriert ist, dass Wasser (44) in das Abschirmelement (12) durch eine oder mehrere Öffnungen (18, 26) in dem Abschirmelement (12) eintreten wird und das Wassererfassungselement (10) nass machen wird, wenn das Abschirmelement (12) in Wasser (44) eingetaucht ist.
 6. Überschwemmungsschutzvorrichtung (2) nach einem der vorhergehenden Ansprüche 4 oder 5, **dadurch gekennzeichnet, dass** das Wassererfassungselement (10) ein Verbund ist, der ein Verbindungselement (30) verschließt, während das Wassererfassungselement (10) trocken gehalten wird, wobei das Wassererfassungselement (10) konfiguriert ist, um bei Kontakt mit Wasser (44) aufgelöst zu werden.
 7. Überschwemmungsschutzvorrichtung (2) nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Überschwemmungsschutzvorrichtung (2) konfiguriert ist, um durch externe Mittel aktiviert zu werden.

Revendications

1. Dispositif de protection contre les inondations (2) configuré pour empêcher la pénétration d'eau à travers un élément de tuyau (24) d'un système de tuyauterie, lequel dispositif de protection contre les inondations (2) comprend :
 - un élément de blocage à utiliser dans l'élément de tuyau (24) du système de tuyauterie, dans lequel l'élément de blocage est un élément gonflable
 - un dispositif d'actionnement configuré pour gonfler l'élément gonflable de sorte que l'élément gonflable est configuré pour bloquer l'élément de tuyau (24),
 - un mécanisme d'actionnement (8) pouvant fonctionner au contact de l'eau (44) ou manuellement, dans lequel le mécanisme d'actionnement (8) est configuré pour activer le dispositif d'actionnement et amenant ainsi l'élément de blocage à bloquer l'élément de tuyau (24) du système de tuyauterie, dans lequel le dispositif de protection contre les inondations (2) est en outre configuré pour être agencé dans l'élément de tuyau (24) et être retiré de l'élément de tuyau (24) sans changement structurel de l'élément de tuyau (24), **caractérisé en ce que** le dispositif d'actionnement est une cartouche de gaz (6) comprenant du gaz comprimé tel que du dioxyde de carbone ou de l'azote pour gonfler l'élément gonflable, et **en ce que** l'élément gonflable est un élément de ballon gonflable (4), par lequel la cartouche de gaz (6) est disposée à l'intérieur de l'élément de ballon gonflable environnant (4).
2. Dispositif de protection contre les inondations (2) selon la revendication 1, **caractérisé en ce que** le dispositif de protection contre les inondations (2) com-

prend un élément de cordon (22) configuré pour guider le dispositif de protection contre les inondations (2) dans une position souhaitée à l'intérieur d'un élément de tuyau (24).

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3. Dispositif de protection contre les inondations (2) selon la revendication 2, **caractérisé en ce que** le dispositif de protection contre les inondations (2) comprend un élément de déblocage relié mécaniquement à l'élément de cordon (22), où l'élément de déblocage est configuré pour débloquer l'élément de blocage empêchant celui-ci de bloquer l'élément de tuyau (24) lors de la traction ou de la poussée de l'élément de cordon (22).
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4. Dispositif de protection contre les inondations (2) selon l'une des revendications précédentes, **caractérisé en ce que** le dispositif de protection contre les inondations (2) comprend un élément de détection d'eau (10) configuré pour activer le dispositif d'actionnement et amenant ainsi l'élément de blocage à bloquer l'élément de tuyau (24).
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5. Dispositif de protection contre les inondations (2) selon la revendication 4, **caractérisé en ce que** le dispositif de protection contre les inondations (2) comprend l'élément de détection d'eau (10) disposé dans l'espace (32) d'un élément de protection (12) comportant une couche interne (14) et une couche externe (16), et **en ce que** l'élément de protection (12) est pourvu d'une ou plusieurs ouvertures (28, 20) configurées pour évacuer l'air ou le gaz à partir de l'espace (32) d'un élément de protection (12), et que l'élément de protection (12) est configuré pour permettre à l'eau d'entrer dans l'espace entre la couche interne (14) et la couche externe (16) à travers une ou plusieurs ouvertures (20) dans la couche externe (16) et pour être déchargée à travers une ou plusieurs ouvertures (18) dans la couche externe (16), et que l'élément de protection (12) est configuré de telle manière que l'eau (44) pénètre dans l'élément de protection (12) à travers une ou plusieurs ouvertures (18, 26) dans l'élément de protection et rendent l'élément de détection d'eau (10) humide lorsque l'élément de protection (12) est immergé dans l'eau (44).
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6. Dispositif de protection contre les inondations (2) selon l'une des revendications précédentes 4 ou 5, **caractérisé en ce que** l'élément de détection d'eau (10) est un composé qui vient boucher un élément de connexion (30) tandis que l'élément de détection d'eau (10) est maintenu au sec, l'élément de détection d'eau (10) étant configuré pour être dissous au contact de l'eau (44).
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7. Dispositif de protection contre les inondations (2) selon l'une des revendications précédentes, **caracté-**

risé en ce que le dispositif de protection contre les inondations (2) est configuré pour être activé par des moyens externes.

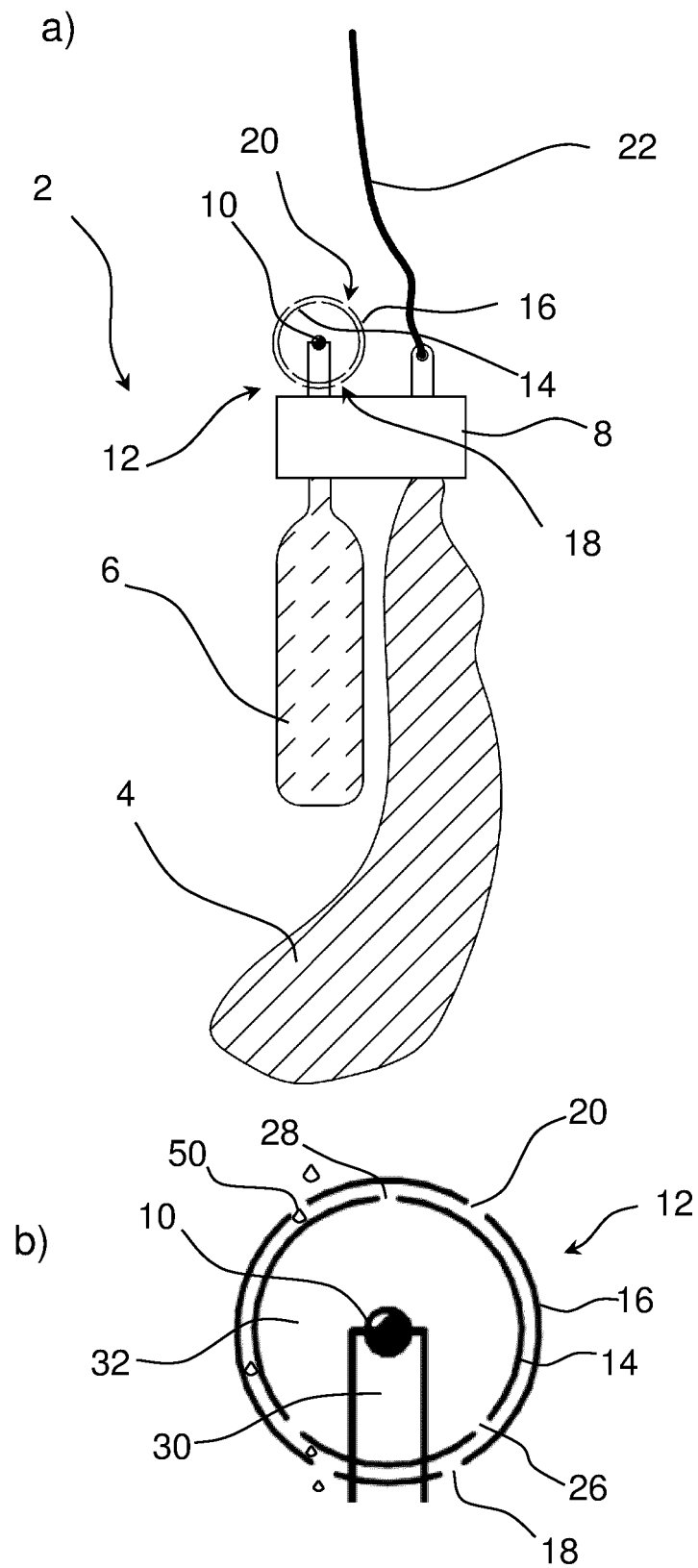


Fig. 1

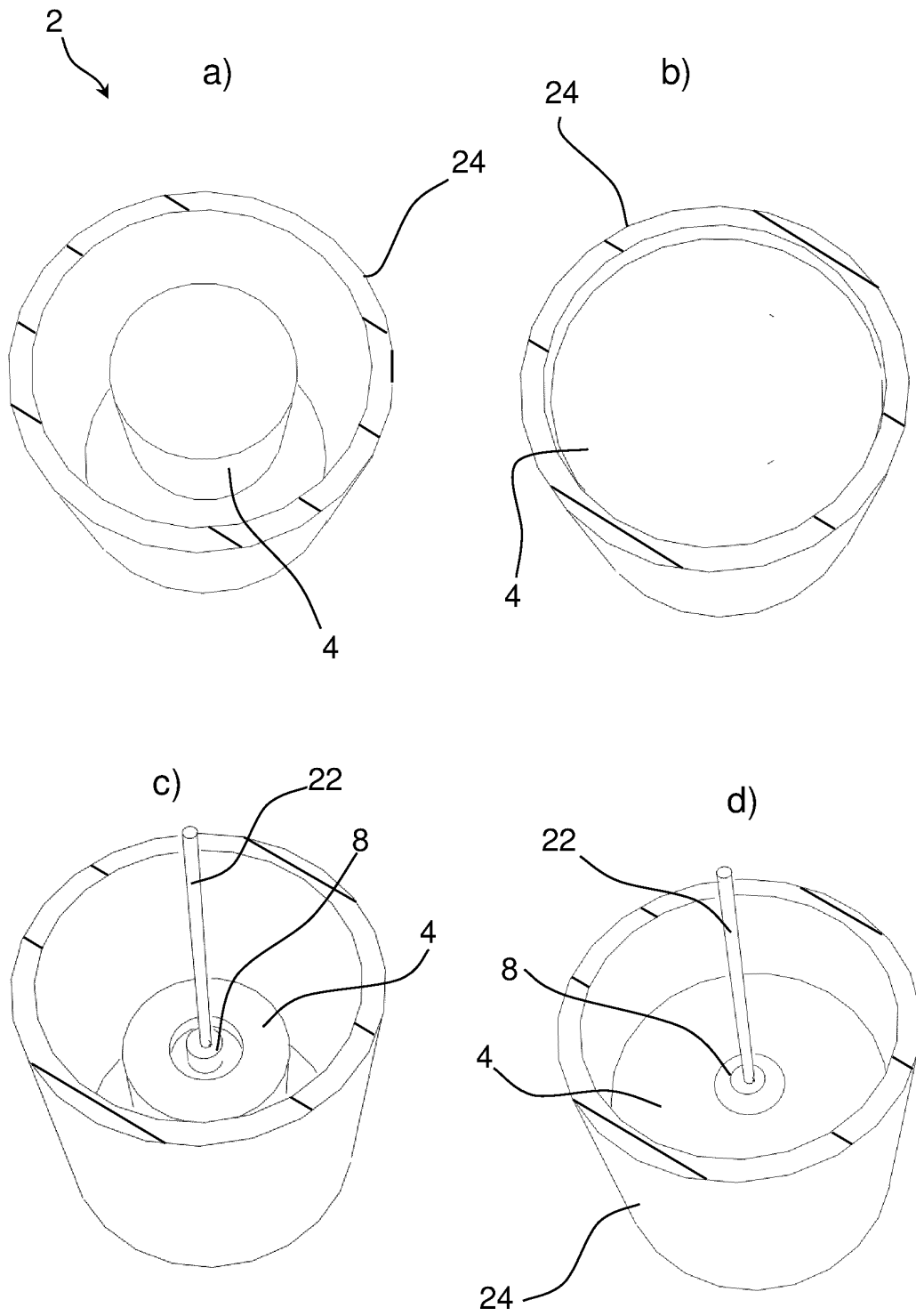


Fig. 2

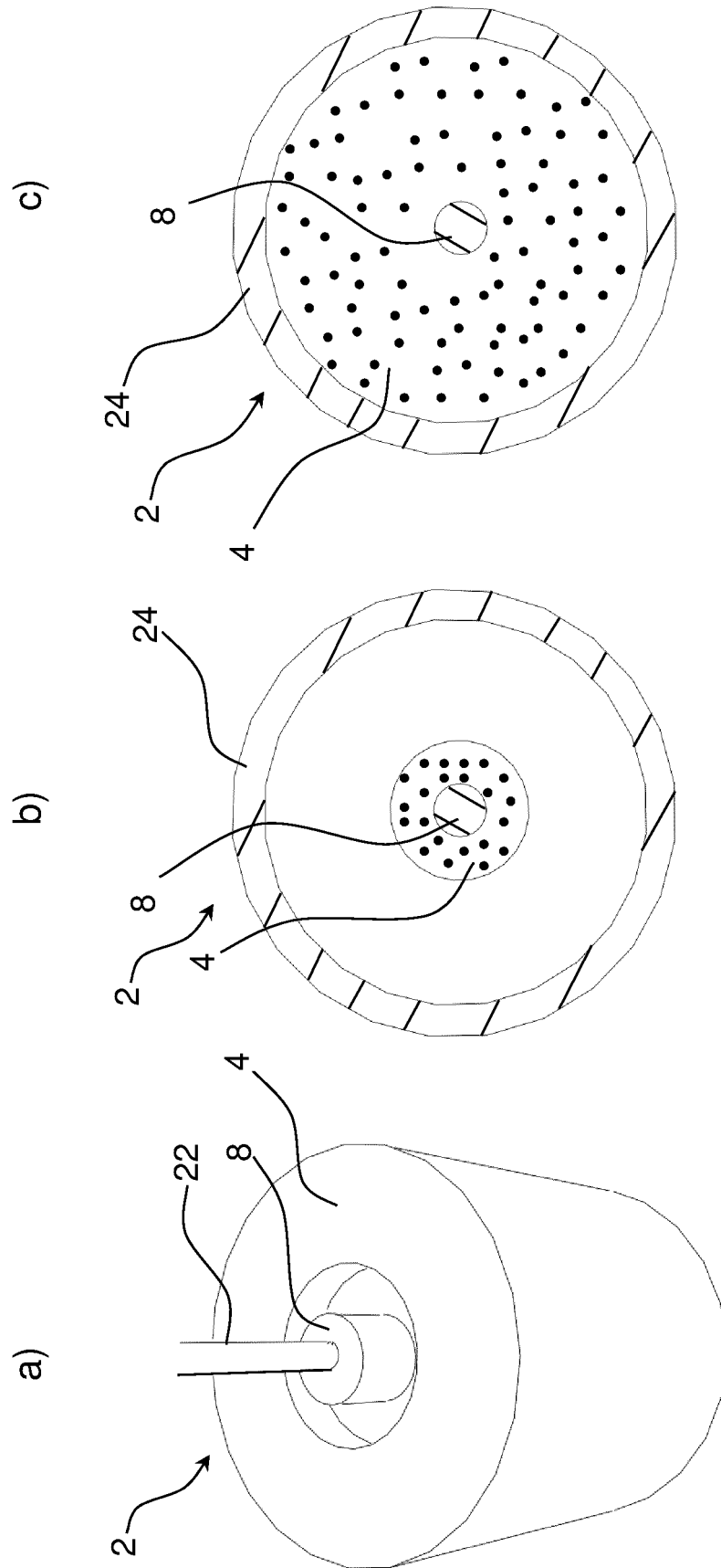


Fig. 3

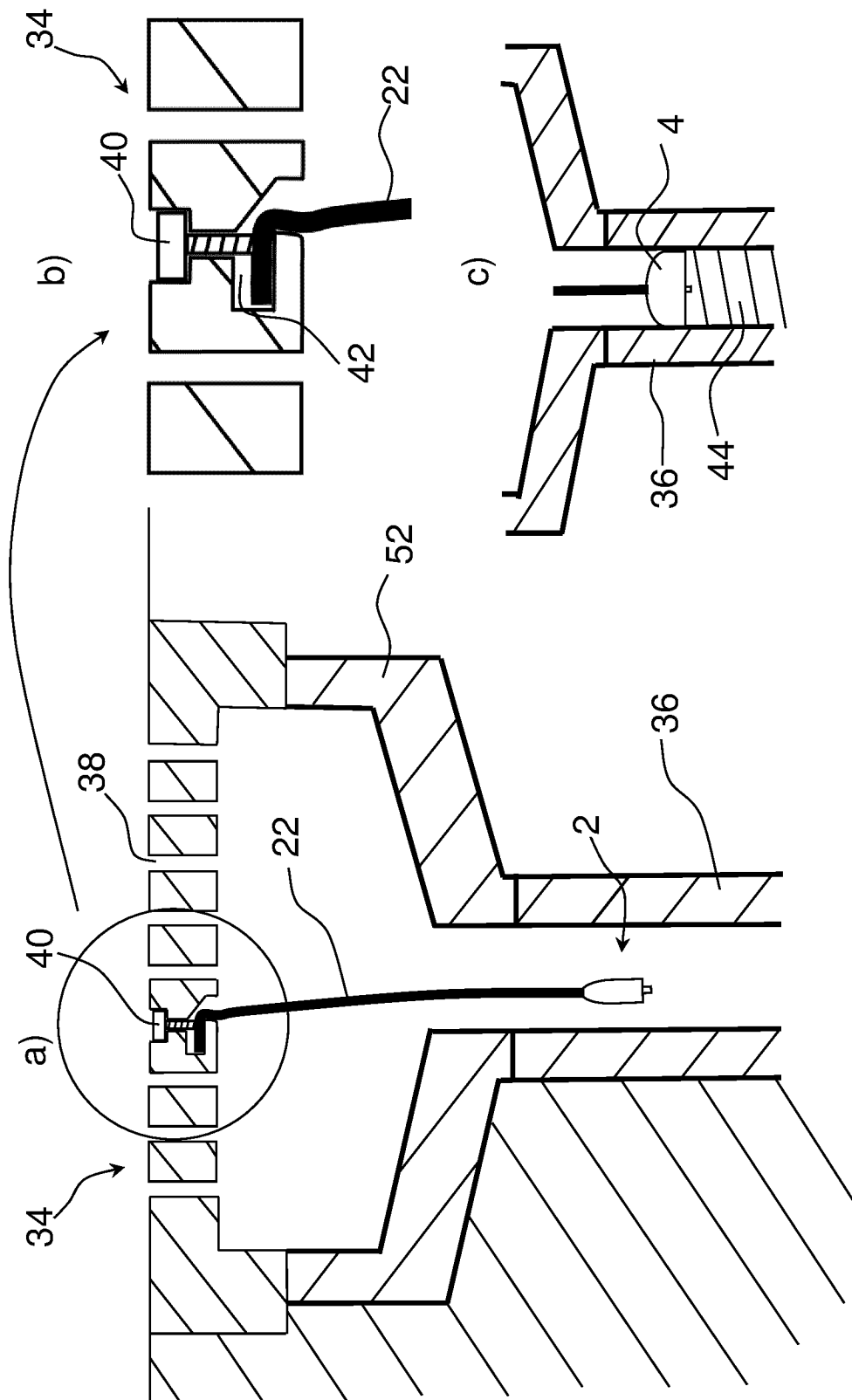


Fig. 4

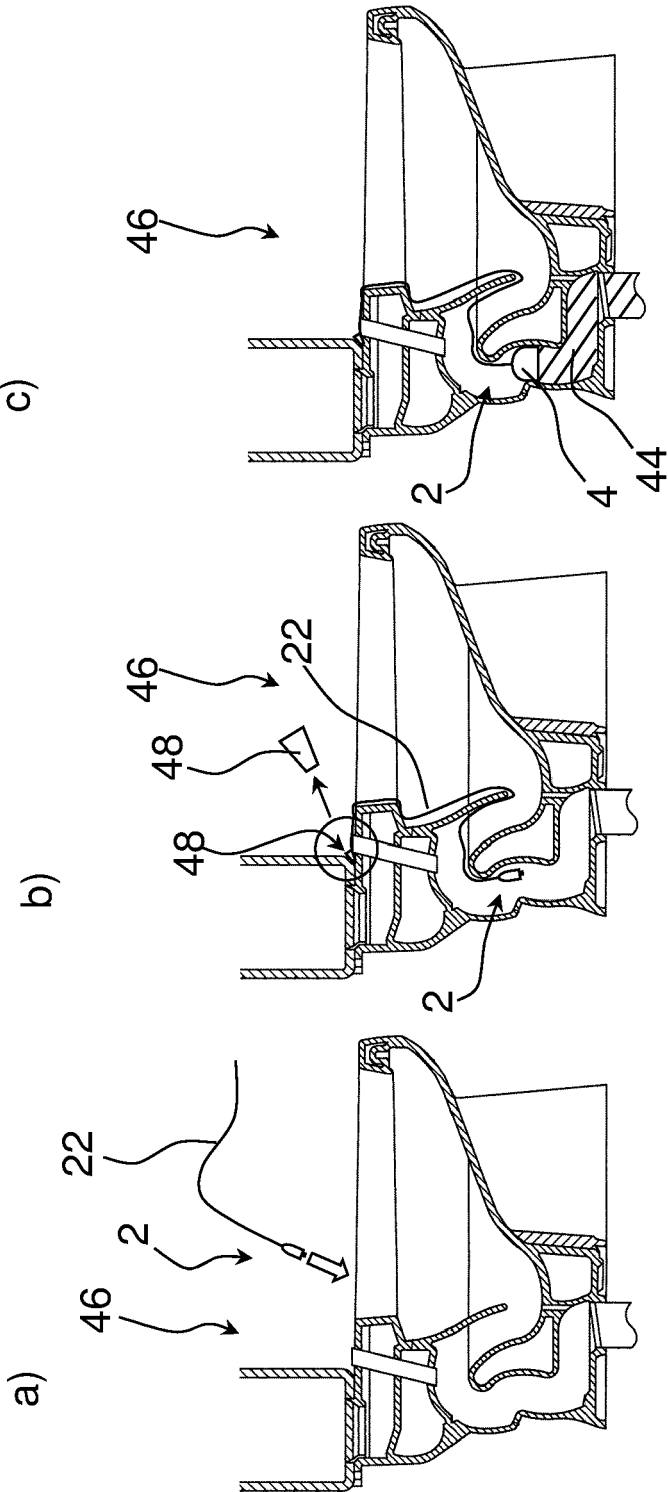


Fig. 5

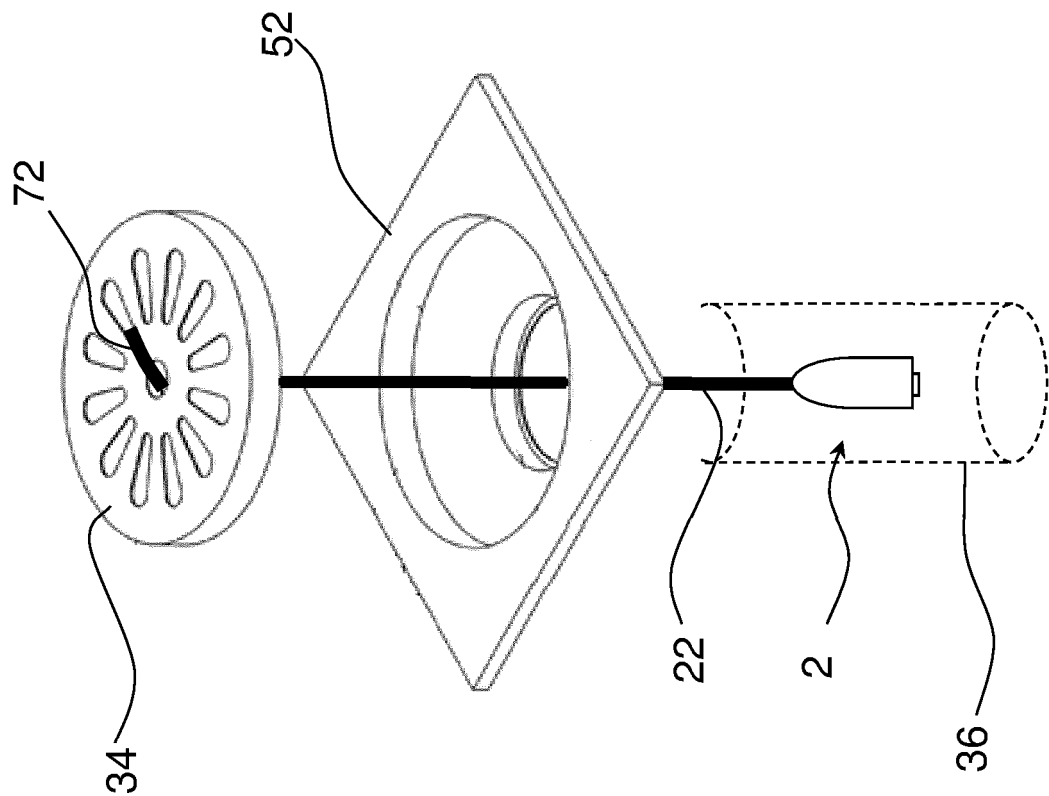


Fig. 6

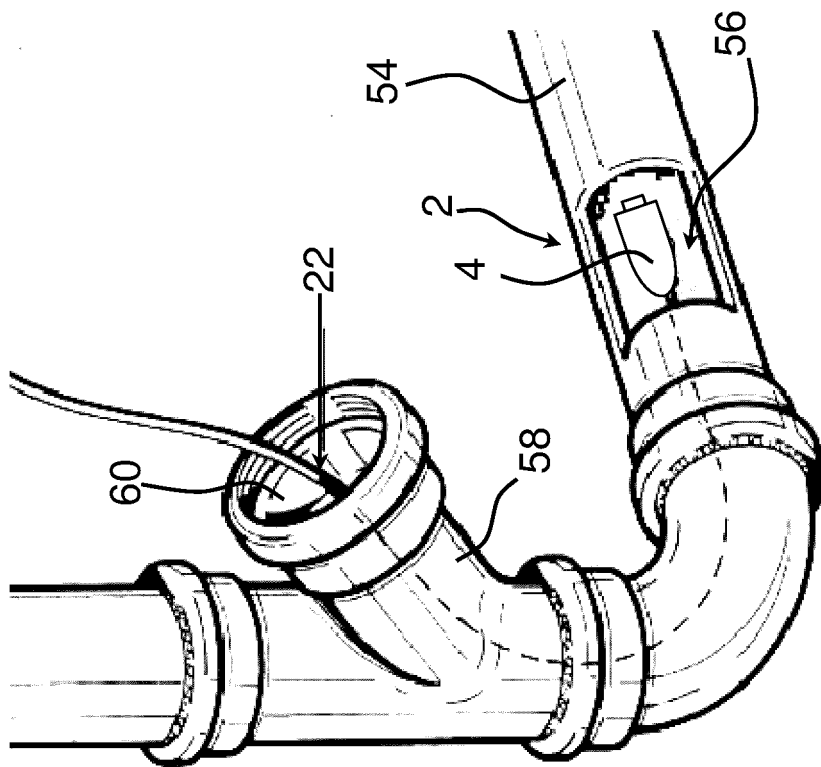


Fig. 7

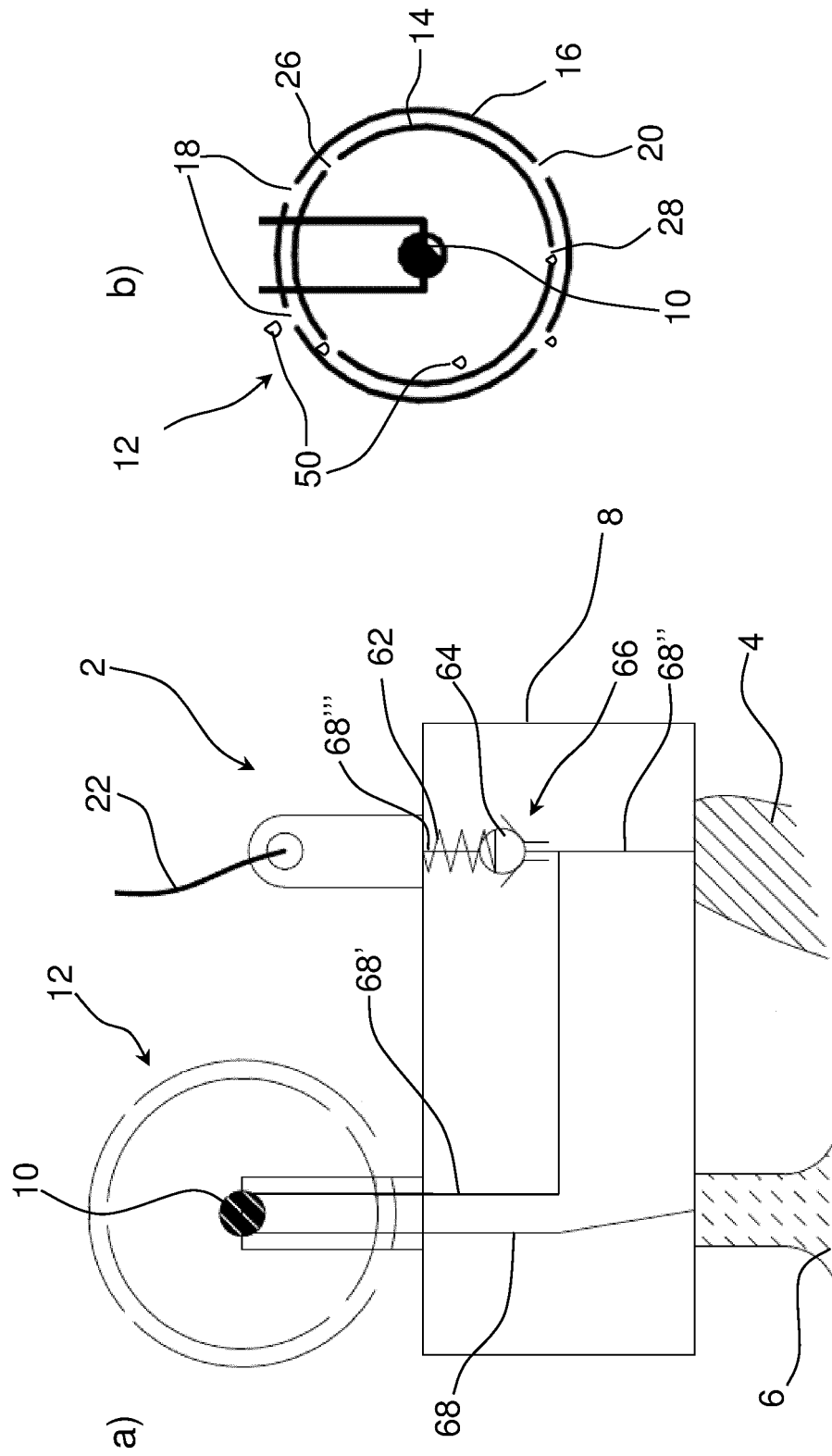


Fig. 8

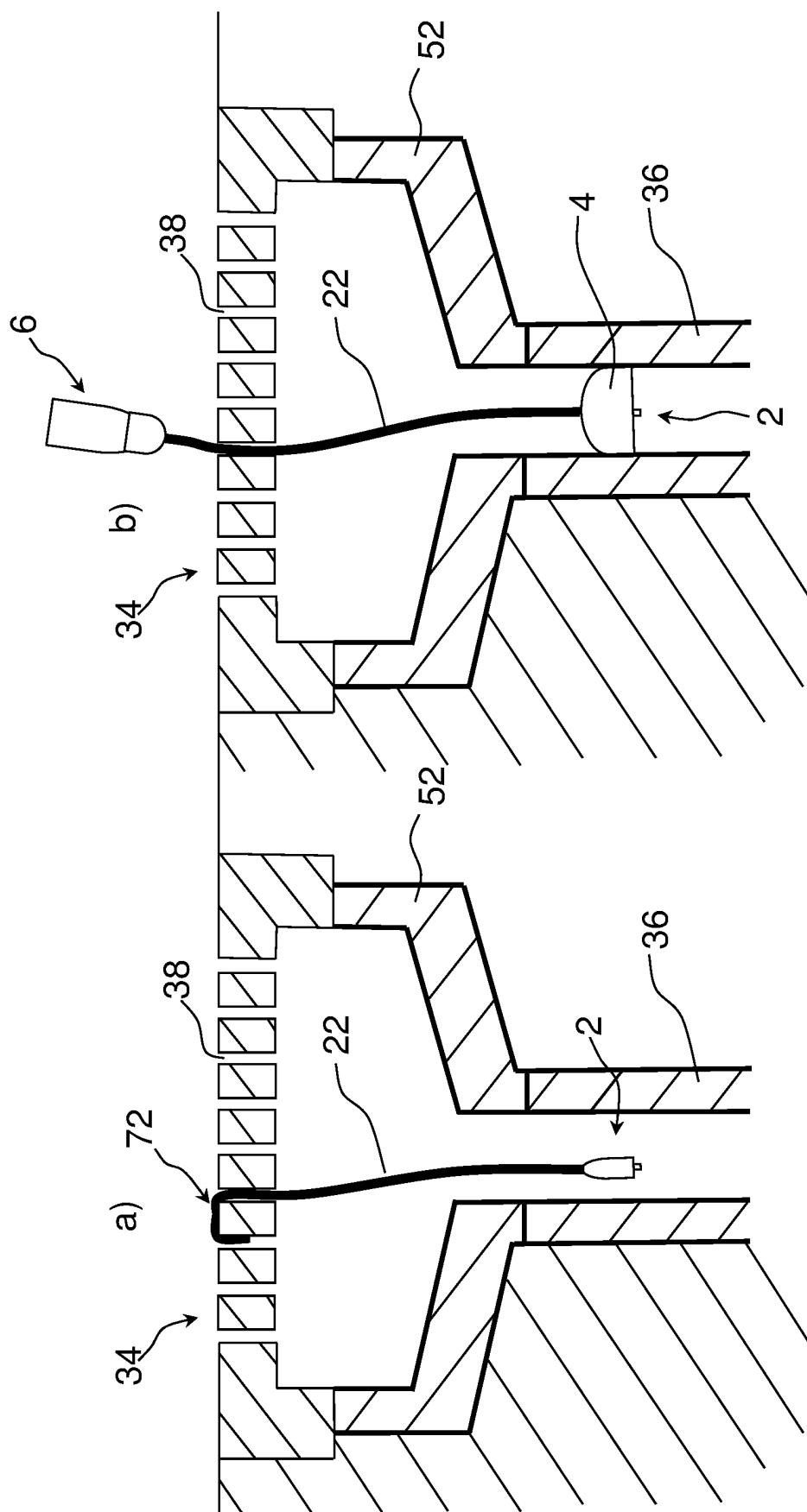


Fig. 9

REFERENCES CITED IN THE DESCRIPTION

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