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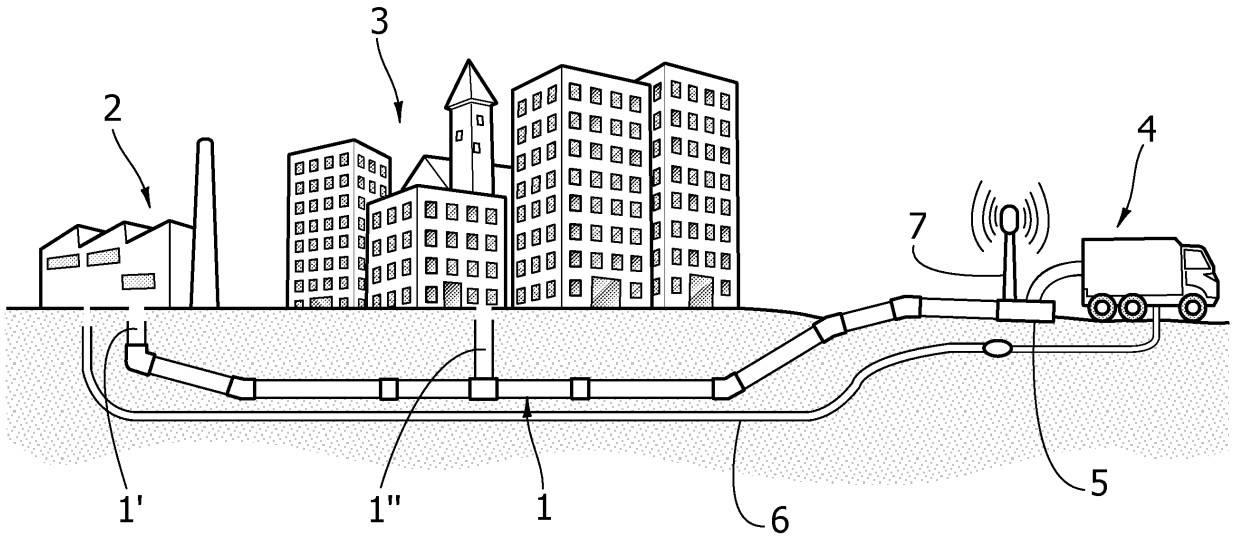
(54) **System for disposal of waste water**

(57) A waste-water disposal system for urban centres, characterized in that it includes a plurality of waste-water collection pipes (1), each of which has a temporary-connection member (5) designed to connect the respective pipe to a mobile depuration means designed for purifying the waste water contained inside the respective collection pipe (1), said mobile depuration means being designed to receive an incoming flow of said waste water and to generate at output a flow of purified water.

FIG. 1



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Description

[0001] The present invention relates to a system for the disposal of waste water, such as for example a sewage system. Understood herein by the term "waste water" are industrial waste water, storm waters, sewage or black waters, and more in general all drainage waters. A sewage system of a traditional type generally includes a main drain pipe for conveying the waters, into which there converge multiple pipes for carrying the waste water from the various points in which it is generated, and which is arranged to carry the waste water to a point of arrival, where there is, for example, provided a depurator or a septic tank, or else where there is envisaged a direct discharge of waste water into a river, lake, or the sea.

[0002] In areas disseminated with small urban centres, such a configuration proves far from efficient in economic terms and extremely invasive from the standpoint of environmental impact.

[0003] In fact, portions of territory without urban settlements and hence ones not "responsible" for the production of waste water are, nevertheless, traversed by an intricate network of piping, the function of which is merely to convey waste water from areas in which it is generated, to a single depuration or collection centre.

[0004] The structures of such a system moreover present considerable dimensions and call for extremely high costs both for their construction and for their maintenance.

[0005] Alternative types of systems for waste-water disposal envisage, instead, depuration centres for each inhabited centre. These additional systems, albeit presenting a much more limited network of piping as compared to the solutions described above, suffer in any case from the high costs due to the multiplication of the number of depurators.

[0006] In addition, sewage systems of a conventional type present as extremely rigid systems, any possible modifications to which entail an extensive intervention on the already existing structure, this involving the need for large amounts of money and means. Consequently, waste-water disposal systems according to the known art are far from readily adaptable to continuously expanding residential centres and, above all, to centres in which there is a marked variability in the number of residents, such as, for example, holiday centres.

[0007] The object of the present invention is to overcome the aforesaid disadvantages by providing a waste-water disposal system characterized in that it includes a plurality of waste-water collection pipes, each of which has a temporary-connection member, which is designed to connect the respective pipe to a mobile depuration means designed for purifying the waste water carried by the respective collection pipe. The mobile depuration means is designed to receive an incoming flow of said waste water and to generate at output a flow of purified water.

[0008] In the disposal system according to the present invention the collection pipes constitute true collection and storage vessels.

[0009] The collection pipes are located in centres where the waste water is generated, from where they leave to reach a site that is suitable for receiving and enabling operation of the mobile depuration means, and extension of said pipes likewise determines their storage capacity. Consequently, the collection pipes present the dual function of conveying the waste water away from the urban centre and at the same time containing it until it is purified.

[0010] In addition, the system according to the invention envisages that the mobile depuration means be prearranged for moving from one of said pipes to another and for being operatively connected to said pipes by means of the temporary-connection members provided on each pipe in order to carry out an instantaneous depuration of the waste water contained therein. It is moreover possible to envisage multiple depuration means according to the load of waste-water disposal required of the system.

[0011] The waste-water disposal system according to the present invention consequently eliminates the need to provide an intricate network of pipes that extends for kilometres from the urban centres up to a main depuration or collection centre.

[0012] In fact, as has already been said, one or more depuration means according to the present invention move from one of the collection pipes of the system to another in order to carry out disposal and depuration of the waste water contained in each pipe. Consequently, in practice, pipes having merely the function of conveying the waste water are absent in the system according to the present invention.

[0013] Thanks to the much more agile and simple structure of the disposal system according to the present invention, the costs of construction and maintenance thereof are hence far more contained as compared to conventional systems.

[0014] In addition, in the system according to the present invention, it is possible to manage the depuration means in such a way that they are adapted to the immediate needs so that they are fully exploited and can be easily geared up to meet the increase in the amount of waste water handled by the system.

[0015] The waste-water disposal system according to the present invention constitutes a modular system that can be readily adapted and transformed in accordance with the development of the territory in which it operates.

[0016] Further characteristics and advantages of the system according to the present invention will emerge clearly in the course of the ensuing detailed description, which is provided purely by way of nonlimiting example, with reference to the attached drawings, in which:

- Figures 1-4 are schematic representations of the waste-water disposal system according to the present invention in different applications.

[0017] Figure 1 is a schematic representation of an urban centre comprising a residential area 3 and an industrial area 2. A waste-water collection pipe 1 of the system according to the present invention starts with two branches 1', 1" from the industrial area 2 and from the residential area 3, respectively, so as to collect and contain within it the waste water produced in said areas.

[0018] The collection pipe 1 proceeds out of the urban centre and terminates in a suitable site for enabling intervention of a mobile depuration means 4. In particular, in the present embodiment, the mobile depuration means are constituted by a lorry carrying a container that includes a chemico-physical depurator, of a conventional type.

[0019] Temporary-connection members 5 of a type in itself known are provided for connecting the collection pipe 1 temporarily to the depurator provided on board the lorry 4 in order to dispose of the waste water contained in the pipe itself.

[0020] In particular, moreover provided in the system represented in Figure 1 is a pipe 6 prearranged for connection to the outlet of the depurator, from which it receives the purified water that is sent to the industrial area for subsequent re-use thereof.

[0021] Associated to the connection members 5 are sensor means for detecting the level of waste water within the collection pipe 1, and transmitter means 7, pre-arranged for sending the level signal generated by the aforesaid sensor to a receiving and monitoring station provided, for example, on board the lorry 4. The level sensor, the transmitter means, and the monitoring station can be of any type suited for the purposes described above.

[0022] An example of operation of the system according to the present invention envisages that the level sensor will generate a warning signal when a pre-set level of filling of the pipe is reached, said warning signal being transmitted via the transmitter means to the monitoring station in such a way that the operator on the lorry 4 is notified of the need to carry out disposal of the waste water contained in the pipe in question.

[0023] Figure 2 represents an example of configuration of the system according to the present invention, provided for serving a plurality of small urban areas.

[0024] As may be seen in Figure 2, each urban centre envisages collection pipes 1, each of which terminates in a site suitable for performing the operations of depuration carried out by the depurator provided on board the lorry 4, in the vicinity of a main road that is convenient for access and transit of said vehicle.

[0025] In the case where the urban centre also comprises industrial areas 2, recirculation pipes 6 stem from the aforesaid site to convey the purified water thereto so that it can be reused. Alternatively, recirculation pipes 6 may be provided, which lead to agricultural centres in which the purified water may be used, for example, for irrigation.

[0026] The lorry 4 travels from one collection pipe to another to carry out disposal of the waste water contained in each collection pipe. For example, an operating scheme may be envisaged whereby the lorry 4 serves the various collection pipes according in a pre-set sequence. Alternatively, the lorry serves the collection pipe in which it is detected that the pre-set level of filling has been reached, as described above.

[0027] According to the embodiment of the invention, illustrated in Figures 1 and 2, it is moreover possible to envisage that the container, provided with depurator and carried by the lorry, will be unloaded from the latter and parked for short periods operatively connected to the collection pipes. The lorry in the mean time is used for displacing further containers between other collection pipes of the system according to the present invention.

[0028] Figures 3 and 4 represent a further example of application of the system according to the invention. In particular, the application represented schematically in said figures envisages the use of the system according to the invention for urban centres located over a coastal territory.

[0029] As may be seen in Figure 3, the collection pipe 1 starts from the urban centre 2 and extends as far as on the bed of the natural basin where the urban centre is located.

[0030] The collection pipe terminates on the sea bed with a blind end 8 that has safety functions for preventing any infiltration of water present in the sea basin into the collection pipe; stemming from said blind end 8 is a pipe 9 connected to a floating buoy 10 provided on which are the temporary-connection members.

[0031] The temporary-connection members are designed to connect the collection pipe 1 temporarily to a chemico-physical depurator on board a watercraft 11.

[0032] Also in this case a level sensor for detecting the level of waste water and a transmitter are provided, which are associated to the buoy on which the temporary-connection members are located, and likewise a monitoring station is provided on board the watercraft 11. In this case, as may be seen in Figure 3, operation of the system envisages that the purified water leaving the depurator is directly poured into the basin.

[0033] Figure 4 illustrates a possible configuration of the system according to the invention, pre-arranged to serve a coastal territory disseminated with small urban centres 2.

[0034] Associated to each urban centre 2 is a collection pipe 1 that extends right into the basin, and a watercraft 11 provided with the depurator is prearranged for moving from one pipe to another to carry out disposal of waste water on each of them.

[0035] Also represented in Figure 4 is a possible pre-set route R for the service performed by the watercraft 11.

[0036] The depuration means used in the system according to the present invention include, for example, a highspeed chemico-physical depurator characterized by a high efficiency of operation. This type of depurator produces at output purified water that can be used without

any problem for industrial purposes or for irrigation and at the same time sludge that is almost completely solid and characterized by small volumes. The sludge is stored within means of transport, on board which the depurator is located, and is subsequently disposed of in appropriate storage areas, without having to undergo any further treatment.

[0037] The waste-water disposal system according to the present invention constitutes a system of a modular type, in which, for example, the already existing collection pipes can be further developed, or else in which new pipes can be implanted without this raising any problem of integration with the system.

[0038] The system according to the present invention moreover enables use of the depuration means according to flexible schemes in order to optimize exploitation thereof and adapt the capacity of service of the system to the current disposal requirements. It is possible, in fact, to envisage variations in the operating times of the individual depuration means, as well as an increase or a decrease in the number of depuration means in service.

[0039] The disposal system according to the present invention proves particularly suitable for territories having urban centres of small and medium size, and characterized by a continuous expansion.

[0040] Of course, the details of construction and the embodiments may vary widely with respect to what is described and illustrated herein, without thereby departing from the scope of the present invention, as defined in the ensuing claims.

Claims

1. A system for disposal of waste water of urban centres, **characterized in that** it includes a plurality of waste-water collection pipes (1), each of which has a temporary-connection member (5), designed to connect the respective pipe to a mobile depuration means for purifying the waste water contained inside the respective collection pipe (1), said mobile depuration means being designed to receive an incoming flow of said waste water and to generate at output a flow of purified water.

2. The system according to Claim 1, **characterized in that** said depuration means is constituted by a chemico-physical depurator provided on board a motor-driven transport means (4, 11).

3. The system according to Claim 2, **characterized in that** said depurator is set on a watercraft (11) or else on a lorry (4).

4. The system according to Claim 1, **characterized in that** said depuration means includes a chemico-physical depurator with a high capacity of depuration per hour.

5. The system according to Claim 1, **characterized in that** said pipes include modular portions that can be differently connected so as to enable said pipes to be varied in their configuration and extension.

6. The system according to Claim 1, **characterized in that** it further includes pipes (6) for disposal of said flow of purified water, designed to convey the purified water into centres where re-use thereof is envisaged.

7. The system according to Claim 1, **characterized in that** said collection pipes (1) extend at least partially on the bed of a natural basin.

8. The system according to Claim 7, **characterized in that** said temporary-connection members are arranged on an element floating on the surface of the water of said natural basin.

9. The system according to Claim 1, **characterized in that** sensor means for detecting the level of waste water, and transmitter means (7) are associated to each of said collection pipes (1).

10. The system according to Claim 9, **characterized in that** said transmitter means (7) are designed to communicate with a monitoring station associated to said mobile depuration means.

11. The system according to Claim 2, **characterized in that** said depurator is set within a container that can be conveyed by said means of transport and can be unloaded from said means of transport and parked for short periods operatively connected to said collection pipes.

FIG. 1

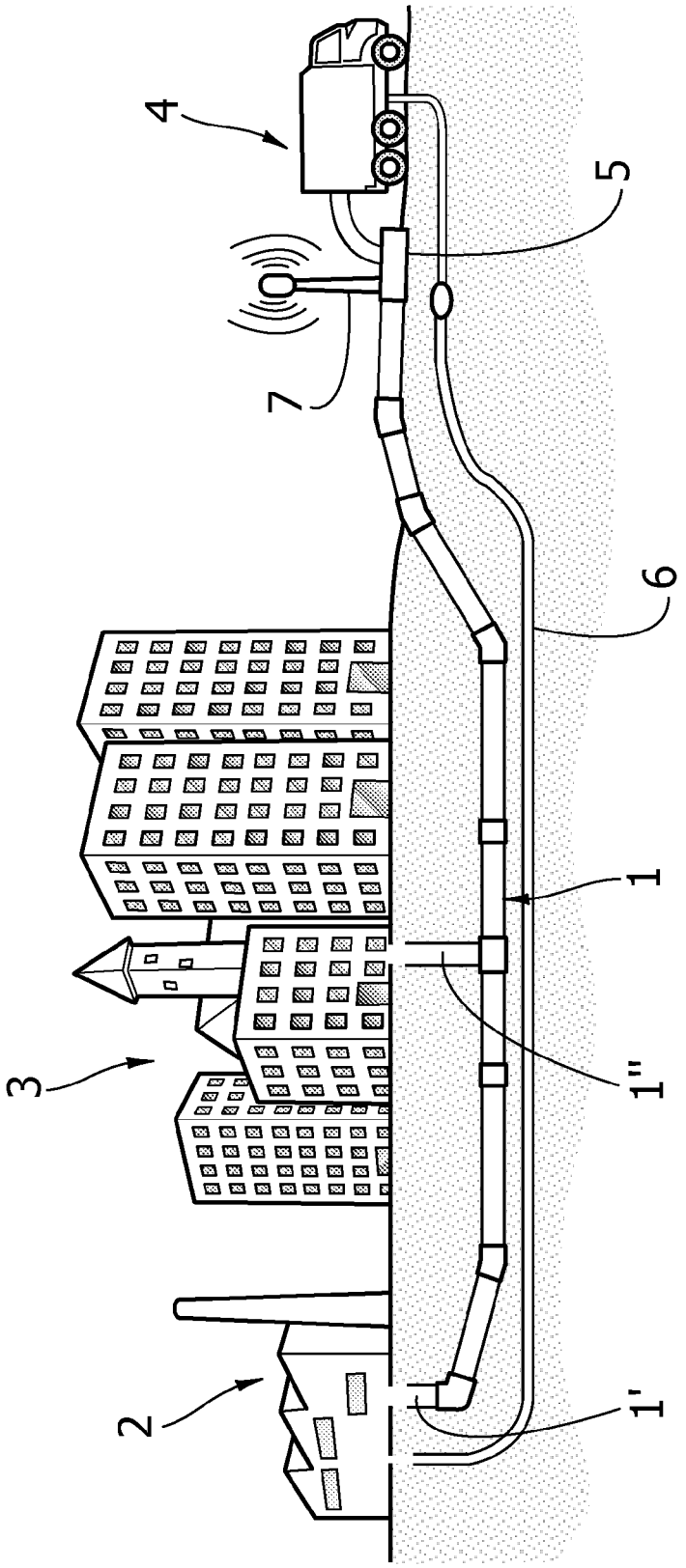

FIG. 2

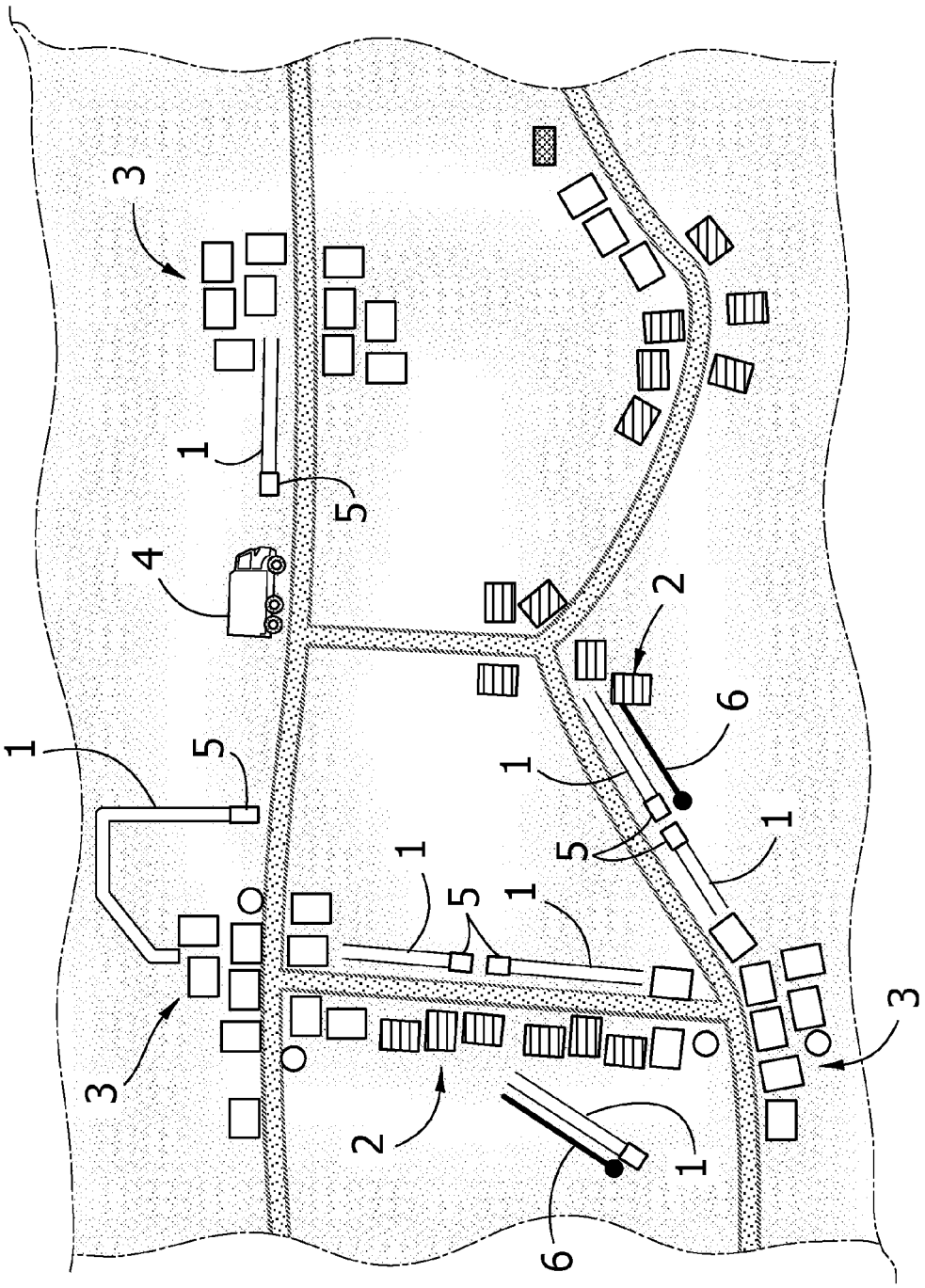

FIG. 3

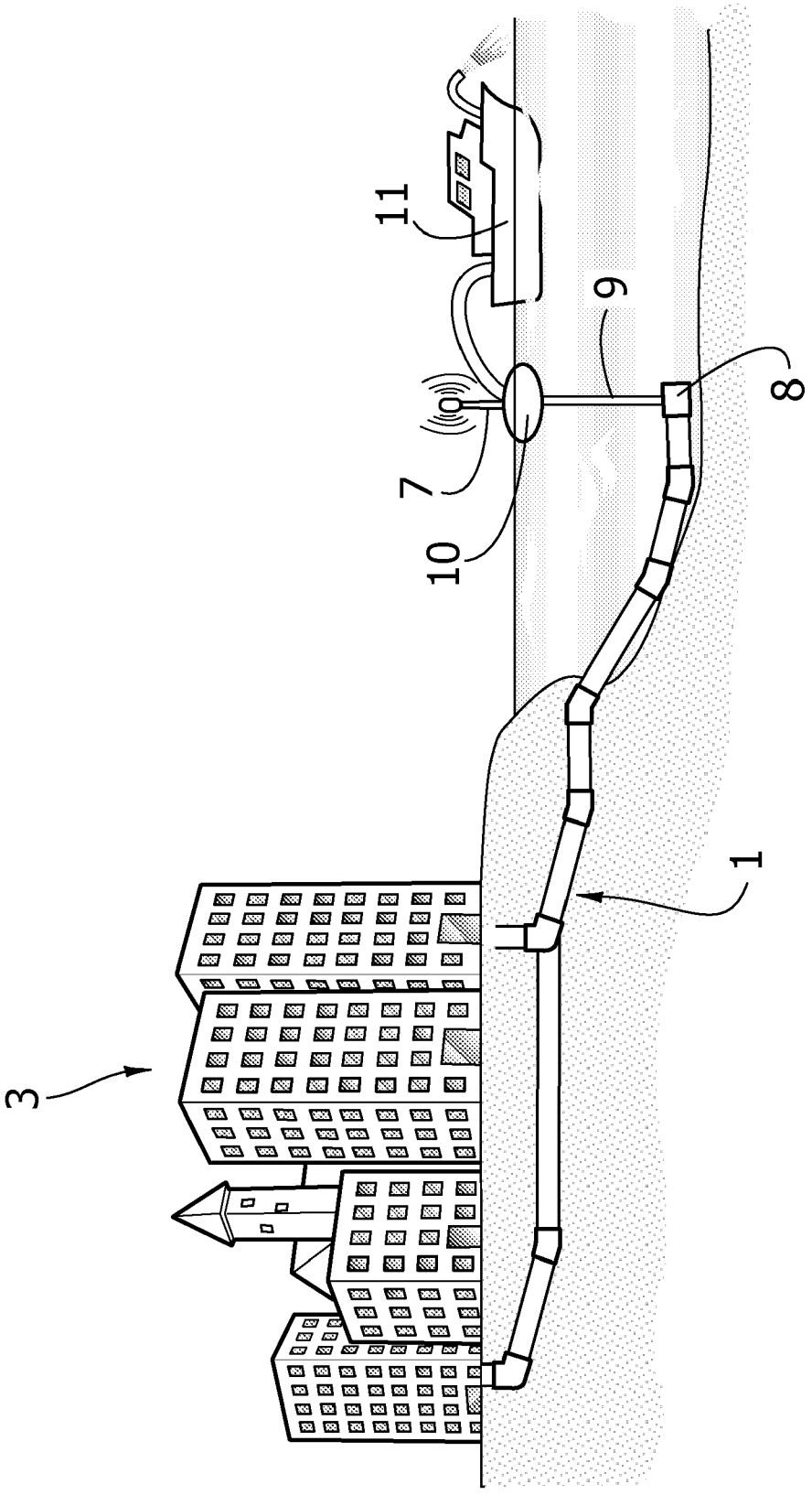

FIG. 4