Title: DEVICE AND METHOD FOR AVOIDING OR CONTROLLING RELEASE OF GASES FROM A LIQUID

Abstract: The present invention relates to an arrangement and a method for preventing or controlling the emission of gases from a fluid (9) to the surroundings, the fluid (9) residing in a tank (2). According to the invention a floating cover (8) is arranged on top of the fluid (9), the floating cover (8) having a density that keeps it stable on top of the fluid (9) in the tank (2) and impenetrable for those gases that are to be contained, wherein a float (10) comprising a standpipe (11) floats on top of the floating cover, the standpipe (11) extending mainly vertically through the floating cover (8) and, in a controlled manner, collecting or letting through the gas that is released or formed in the fluid (9).
For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.
"Device and method for avoiding or controlling release of gases from a liquid."

The present invention relates to an arrangement and a method for avoiding or controlling the emission of gasses from a fluid to the surroundings, the fluid residing in an initially open vessel or basin.

In numerous applications of an initially open vessel or basin, the content may contain or produce gases that either smell bad, or constitute a hazard in terms of being dangerous to inhale or being inflammable. A number of solutions exist today that to a greater or lesser extent provide a remedy for this problem. One example solution is the use of ventilation systems comprising filters or collection tanks.

An example of an application where these problems may arise is a pump house for sewer and waste water. These are commonly positioned near by densely populated areas and provide for collection points for sewer and waste water before the sewer and waste water is sent on to the next pumping house or possibly a sewage treatment plant or the like. These pump houses commonly comprise inlet pipes, an open collection tank, in addition to pumps that lead the sewer and/or spill water on to outlet pipes. As mentioned, the collection tanks are usually not closed, and waste gas in the form of methane, Nitrogen and so forth, may be released out of the pump house and into the surrounding air. Of various reasons, it is not considered viable to use closed collection tanks or sealed pump houses.

Thus, there exists a need for a secure, cost efficient and relatively maintenance-free system that may avoid or control the emissions from pump houses or similar structures, comprising open tanks or basins holding fluids that either already contain or produce gases that may escape into the surrounding air.

The object of the present invention is to provide an arrangement and a method that solves the abovementioned problems. The arrangement according to the present invention is characterized by the features disclosed in the characterizing
clause of claim 1, and the method is characterized by the features disclosed in the characterizing clause of claim 11. Further advantageous embodiments of the present invention are given in the dependent claims.

The following description presents non-limiting examples of preferred embodiments of the present invention with reference to the attached drawings, in which:

Fig. 1 is a sketch of a pump house showing one embodiment of the present invention,

Fig. 2 is a sketch of another embodiment of the present invention, in which a filter is integrated with a float,

Fig. 3 shows the float of fig. 2 at a grater scale, and

Fig. 4 shows the embodiment of fig. 1 in greater detail.

Fig. 1 shows a mainly open pump house 1 with a tank or basin 2 comprising a sewer inlet pipe 3, pumps 4 and outlet 5. The pump house 1 shown in fig. 1 also comprises a manhole 6, a ladder 7 and possibly auxiliary equipment for controlling the system, and pumps, tanks and filters for processing of the gas and/or sewer.

According to the present invention, the abovementioned problem is partly solved by providing a floating cover 8 on top of the sewer or waste water 9.

The floating cover 8 must have a density that keeps it floating in a stable manner on top of the content of an open tank 2. Furthermore, the floating cover 8 must advantageously have a viscosity that dampens the movement of the content of the tank 2, this resulting in an advantageous effect on the pumping ability of the pumps 4 in the pump house 1. The floating cover must be impenetrable for those gases that one attempts to contain. Furthermore, the floating cover 8 must not be poisonous or an environmental hazard, and must not in it self produce unwanted gases or waste products. The floating cover 8 may for example comprise plant
oils, synthetic oils, straight chained dodecylbenzene, as well as approved surfactants (tensides) that inhibit the generation of disagreeable odors from exposed components in the pump house 1 if the level of the tank 2 is low.

The floating cover 8 will form a "dynamic" cover on top of the content of a tank or a basin, i.e. the floating cover 8 will in practice "follow" a rising, reducing or fluctuating level in a tank or basin 2, regardless of a changing surface area, if various components are exposed or covered, or the rate of change of the rising, reducing or fluctuating level.

When gases are formed and/or released from the content of the tank 2, the gas will rise up and be collected underneath the floating cover 8. It is an important feature of the present invention to remove these gases in a controlled manner. This is achieved by a float 10 comprising a pipe or tube 11 that extends mainly vertically through the floating cover 8 into an inlet 12 immediately below the floating cover 8. The gas collected underneath the floating cover 8 draw towards and into the inlet 12, through the pipe or tube 11 and further through tubes 13 to a filter 14, until it ends up in a collection tank or some other device for processing of the collected gas.

In a preferred embodiment of the present invention, the pipe or tube 11 is telescopic, thereby facilitating an easy adjustment of the length of the pipe or tube 11 in order for it to be easily adaptable to the thickness of the floating cover 8. It is understood that the pipe or tube 11 may be constructed in any other suitable manner that permits the length of the pipe or tube 11 to be adapted to the thickness of the floating cover 8, e.g. a bellow, threads permitting additional pieces to be added to the pipe or tube 11, or an angle joint that can be extended or compressed.

The inlet 12 is preferably equipped with a sludge filter 15.

If the gas only is lead through a filter 14 before it is released into the atmosphere, the filter 14 may comprise silicates, e.g. in the form of a silica gel in order to draw out (absorb) condensation before the gas reaches the actual filter, in addition to
aroma and/or other substances that may neutralize odors and/or render harmless toxic gases. The filter 14 may either be provided directly on the float 10, or directly in connection with the float 10, as shown in figs. 2 and 3, or it may be provided some distance from the float 10, as shown in figs. 1 and 4, in such a manner that a flexible tube 13 or the like brings the gas from the float 10 to the filter 14. In this manner the filter 14 may be positioned in a easily accessible part of the pump house that makes it easier to clean, replace or service the filter 14.

In an alternative embodiment, the tube 13 may lead the gas to a collection tank for some kind of after treatment, e.g. burning, scrubbing etc.

Some place on the float 10, tube 13 or in the pump house 1, there should be positioned a shut-off valve 16 that may block the entrance of fluid in the pipe or tube 11, or other elements downstream of the pipe or tube 11. It is important that the pipe or tube 11, tube 13 and the filter 14 or the collection tank does not contain considerable amounts of the substance that constitutes the floating cover 8, because this may block the free passage of gases. When the float 10 is to be positioned on or removed from the floating cover 8, the shut-off valve 16 should be closed in order to prevent entrance of the substance constituting the floating cover 8, where after the shut-off valve 16 again may be opened when the float 10 is correctly positioned on the floating cover 8. The shut-off valve 16 may be positioned on the float 10, but is preferably positioned in a more accessible part of the pump house 1.

In the simplest embodiment of the invention, a floating cover 8 is provided on top of the sewer of waste water, after which a float 10 of the abovementioned kind (fig. 3) is positioned on top of and through the floating cover 8. In addition, the float 10 shown in fig. 3 comprises a length adjustable pipe or tube 11, an inlet 12 and a sludge filter 15, as well as an integrated shut-off valve 16 and filter 14. A float 10 of the kind shown in fig. 3 is shown in use in fig. 2. The float 10 shown in fig. 3 may in addition be provided with a layer of silica gel 17 or the like, though which the gas must penetrate before it reaches the filter 14. As mention above, the silica gel layer provides to dry the gas before it reaches the filter 14, thereby increasing the
effect and lifetime of the filter 14. In addition, it is preferred that the float 10 has a rounded design in order to prevent the float from getting caught on other equipment in the tank.

5 In a preferred embodiment of the present invention, shown in fig. 1 and 4, the float 10 is arranged on a rail 18 that guides the float up and down. In this embodiment, the tube 13 must be sufficiently long to follow the floats 10 movement all the way up and down the rail 18, at the same time as it must not get in the way of the float 10 or in any way get caught. The advantage of this embodiment is that the float 10 does not stand in risk of going astray in other equipment if the level in the tank 2 becomes especially high or low. It will also be easier to get a hold of the float 10 from a possible ladder 7 in case of service or the like.

According to another aspect of the present invention, Oxygen may be provided to the content of the tank 2, preferably near the bottom of the tank. The rail 18 may be adapted for this use, as shown in fig. 1 and 4, by forming a channel for Oxygen down to the bottom of the tank 2, or it is possible to provide an independent supply for the Oxygen. The purpose with supplying some Oxygen underneath the floating cover 8 may be to avoid Nitrogen excess in the sewer and/or spill water and/or contribute to a more aerobic decomposition of the sewer, resulting in a production of other kinds of gases with friendlier "odor profiles".

By yet another aspect of the present invention, the floating cover 8 contributes to avoid the creation of a dry layer on top of the contents of the tank 2, especially when the content is stagnant. The creation of a dry layer on top of the contents of the tank 2, may lead to problems when large, perhaps hard, pieces of material get drawn into the pumps 4, possibly resulting in pump damage.

In one application of the present invention, in which the problem is odor from a pump house 1 for sewer/waste water of the kind shown in fig. 1, a rail 18 is arranged in a suitable location of the tank 2, various pipes and tubes 13 are arranged or set up, a filter 14 is arranged in a suitable, easily accessible location of the pump house, and an Oxygen supply system is possibly prepared. The float 10, connec-
ted to the tube 13, is positioned on top of the sewer/waste water while the shut-off valve 16 initially is closed. A suitable amount of a suitable floating cover 8 is poured into the tank 2, where after the floating cover 8 is given sufficient time to rise to the surface of the sewer and settle. It must be ensured that the pipe 11 is of correct length in comparison to the thickness of the floating cover. If not, the length of the pipe 11 is adjusted, or alternatively the thickness of the floating cover. Next, the shut-off valve 16 is opened and a possible Oxygen supply system is started. As gases are produced or precipitate from the sewer and collect underneath the floating cover 8, the gas is lead through the pipe 11, thought the tube 13 and into the filter 14, whereupon the filtered gas may be released into the surrounding air. The level of the tank 2 can freely fluctuate while the tensides in the floating cover 8 contribute to prevent the worst odor from the walls of the tank and the exposed parts of the tank when the content level of the tank 2 is low,

If for some reason the tank is to be fully emptied, the abovementioned steps may be reversed, and the floating cover may be poured into and stored in cans, barrels or the like for possible reuse.
CLAIMS

1. Arrangement for preventing or controlling the emission of gases from a fluid (9) to the surroundings, the fluid (9) residing in a tank (2), characterized in arranging a floating cover (8) on top of the fluid (9), the floating cover (8) having a density that keeps it stable on top of the fluid (9) in the tank (2) and impenetrable for those gases that are to be contained, wherein a float (10) comprising a standpipe (11) floats on top of the floating cover, the standpipe (11) extending mainly vertically through the floating cover (8) and, in a controlled manner, collecting or letting through the gas that is released or formed in the fluid (9).

2. Arrangement according to claim 1, characterized in that the gas collected by the float (10) is brought through one or more filters (14).

3. Arrangement according to claim 1 or 2, characterized in that the gas collected by the float (10) is brought into a collection tank for subsequent treatment, e.g. flaring, scrubbing, disposal or the like.

4. Arrangement according to claim 1 or 2, characterized in that the gas collected by the float (10) is brought through a filter (14) that is arranged on the float (10) or in near proximity to the float (10).

5. Arrangement according to claim 1 or 2, characterized in that the gas collected by the float (10) is brought through a filter (14) positioned some distance from the float (10), the gas being brought through an at least partially flexible tube (13) in order to make the float able to move freely in the tank (2) and follow the level in the tank (2).
6. Arrangement according to one of the previous claims, characterized in that the float (10) moves along a mainly vertical rail (18), the rail (18) having a suitable position in the tank (2), the rail (18) providing an easy access to the float (10) from a possible ladder (7) extending down the tank (2) and/or preventing the float (10) from going astray in the tank (2).

7. Arrangement according to one of the previous claims, characterized in that the floating cover (8) has a viscosity that contributes to damp the movement of the fluid (9) in the tank (2).

8. Arrangement according to one of the previous claims, characterized in that a shut-off valve (16) is arranged on the float (10) or downstream the float (10).

9. Arrangement according to one of the previous claims, characterized in that the floating cover (8) comprises plant oils, synthetic oils, straight chained alcylate, such as dodecyl benzene, and possibly permitted tensides that contribute to inhibit the development of disagreeable odors from exposed elements of the pump house (1) if the level in the tank (2) is low.

10. Arrangement according to one of the previous claims, characterized in that the gas collected by the float (10) is brought through silica gel or a similar substance that contributes to dry the gas before is brought on to a filter (14) or some form of after treatment.

11. Method for preventing or controlling the emission of gases from a fluid (9) to the surroundings, the fluid (9) residing in a tank (2), the method being characterized in comprising the steps of:

   - arranging a floating cover (8) on top of the fluid (9), the floating cover (8) having a density that keeps it stable on top of the fluid (9) in the tank (2) and impenetrable for those gases that are to be contained,
- arranging a float (10) comprising a standpipe (11) on top of the floating cover, the standpipe (11) extending mainly vertically through the floating cover (8), a shut-off valve (16) arranged on the float (10) or downstream the float (10) being closed while the float (10) is arranged on top of the floating cover (8),

- opening the shut-off valve (16) when the floating cover (8) has settled.

12. Method according to claim 9, characterized in reversing the abovementioned steps when the floating cover (8) is to be removed, possibly saving the fluid constituting the floating cover (8) for future use.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: E03F 5/10, B65D 88/34 // E03F 5/08
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: E03F, C02F, B01D, B65D, A01C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE, DK, FI, NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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<th>Relevant to claim No.</th>
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[X] Further documents are listed in the continuation of Box C.  [X] See patent family annex.

* Special categories of cited documents

"A" document defining the general state of the art which is not considered to be of particular relevance

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"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

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Date of the actual completion of the international search: 5 November 2003

Date of mailing of the international search report: 06-11-2003

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