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(54) Leakage containment system for an underground tank, and assemblying method therfor

(57) An assembling method of a leakage containment system for an underground tank and related system, the latter comprising a containment structure (4) of said tank (2) apt to be located in a ground break (1), a tank support base (7) internally located in said containment structure (4), and a tank (2) apt to be fixedly arranged on said base (7), the system being characterised in that said containment structure (4) is made in a gas- and liquidproof imputrescible flexible material.

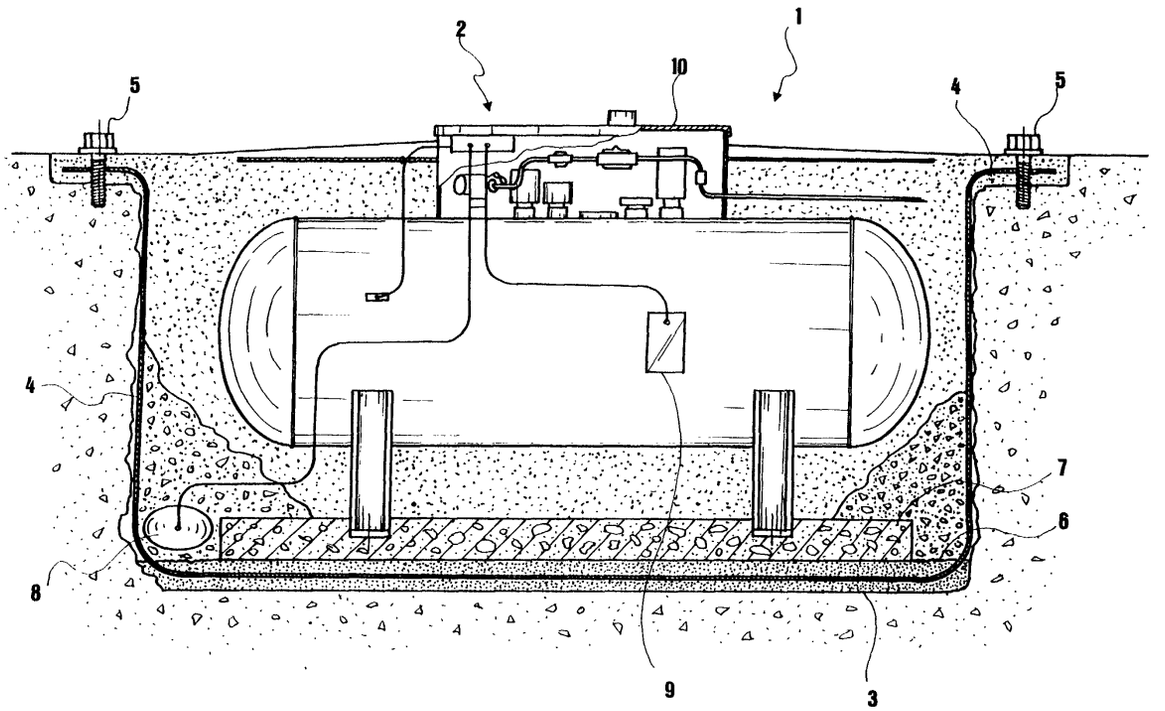

FIG.1

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Description

[0001] The present invention relates to a system and to a method apt to prevent the seeping of possible leakage in the ground surrounding an underground tank and, more specifically, to a system and to a method for the containment of possible leakage from an underground tank of gas or the like.

[0002] The use of underground tanks containing gas or the like is already widely known to the art. This use is dedicated, e.g., to tanks stocking liquid or gaseous fuel, e.g., LPG destined to domestic-type consumption, typically located underground somewhere near the user.

[0003] For LPG tanks having a ≤ 5 m^3 capacity, the existing norms provide that the same may be laid underground inside of a containment box made in reinforced concrete, mainly aimed in case of leakage at circumscribing the pollution to the sole ground contained inside of the box, thus preserving the surrounding ground.

[0004] Such containment boxes may be formed on site or prefab. The use of this solution entails several practical and economical disadvantages.

[0005] A first disadvantage is entailed in the need to implement a box in reinforced concrete which may be formed on site or prefab. In the first case, a formbox structure for the forming of the concrete has to be provided, with the entailed complication due to the concrete casting. On the other hand, in the second case the former has to be hauled from the manufacturing to the laying site, with the apparent problems related to the dimensions and weights thereof.

[0006] A second disadvantage is entailed in the fact that the concrete structure thus obtained should anyway be surface-treated with waterproofing paints so as to render the former suitable.

[0007] Hence, the object of the present invention is to overcome the abovementioned disadvantages of the state of the art providing a leakage containment system for an underground tank of simple and reliable implementation and providing an utmostly easy installation thereof, thus reducing the production and installation costs.

[0008] According to the present invention a leakage containment system for an underground tank is provided comprising a containment structure apt to be located in a ground break, a tank support base internally located in said containment structure, and a tank apt to be fixedly arranged on said base, the system being characterised in that said containment structure is made in a flexible material.

[0009] The present invention further provides an assembling method of the leakage containment system characterised in that it comprises the following steps:

- making a ground break of a substantially parallelepiped shape and of dimensions substantially larger with respect of the overall ones of said tank;
- laying a first layer of sandy material or the like onto the bottom wall of said break;
- positioning a structure made in a flexible material inside of the break so as to cover every wall of the latter, and so as to have a portion of the former outcropping from the latter;
- ground-securing said outcropping structure portion with securing means and at the corner areas of said break;
- laying a second layer of sandy material at the bottom portion of said structure;
- arranging a support base of said tank on said second layer;
- positioning and securing said tank on said base; and

filling up the break with earthy material or the like.

[0010] A detailed description of a preferred embodiment present invention, given by way of example and without limiting purposes, will hereinafter be provided making reference to the single drawing annexed in Fig. 1, in which the system of the present invention is sectionally and partially depicted.

[0011] According to the present invention, it is provided that a ground break 1 apt to contain a tank 2 be made, wherein the latter is first positioned and then underground. The system provides that the break be preferably made in a parallelepiped shape.

[0012] Subsequently to the break, a sandy material layer 3 apt to level possible surface unevennesses of the bottom wall of the former is laid. Then, a case 4 in a gas- and liquid-proof (impermeable), imputrescible and flexible material, like, e.g., high-density polyethylene, is laid. Said case 4 is of dimensions and shape apt to cover every wall of the break up to the outcropping of a portion of the case 4 at the perimetral edge area of the break 1.

[0013] It has to be pointed out that the case 4 may alternatively be implemented in any one material (natural or synthetic) provided the gas- and liquid-proofing, as well as the imputrescibility characteristics be maintained. E.g., polyethylene, polypropylene, PVC and the like may be used.

[0014] Furthermore, at the top corners of the break 1 it is provided that the outcropping portion of case 4 be ground-secured with pegs 5 or with likewise securing means, removably located in the ground surrounding the break 1.

[0015] In this condition, first a second layer of sandy material 6 is laid, then a reinforced-concrete slab 7 apt to provide the support base for the tank 2 inside of the break 1 is arranged. It has to be pointed out that the layer 6 creates a laying bed and an interspace layer between the case 4 and the slab 7, thereby avoiding injuries to the case 4 due to a possible contact between the latter and the slab 7.

[0016] Subsequently, the tank 2 is positioned onto the

slab 7 in the known manner. Then, the break 1 with the tank 2 positioned therein may be filled up as usual, i.e., with riddled earth, up to a set height so as to underground the anodes, and then filling up the remaining space with sand, like, e.g., inert river or pit sand or the like until covering up the whole system, including the portion of the case 4 outcropping from the break 1 and secured by the pegs 5.

[0017] It has to be pointed out here that the system of the present invention is also apt to provide the cathodic protection of the tank 2 in compliance to the existing norms. More precisely, it may be provided that in the underground of the break one or more sacrificial anode 8 and related reference anode 9 be positioned, as it is already known in the state of the art. Furthermore, the system of the present invention is suitable to the assembling of a control well 10 of the tank 2 containing the controlling and monitoring means thereof and usually provided at the top portion of the tank 2 outcropping from the break 1, as it is already known in the state of the art.

[0018] The system of the present invention has a first advantage in that it provides a leakage containment system for an underground tank having an utmostly simple, and concomitantly extremely effective, installation.

[0019] A second advantage of the system of the present invention is provided by the fact that, due to the utmost easiness of implementation and hauling exhibited by the case 4 it overcomes all the problems related to the containment boxes in concrete or polyethylene shell-vaults, and to the containment systems of the state of the art.

[0020] A third advantage of the system of the present invention is provided by the extremely low cost of the case 4 with respect to the containment systems of the state of the art.

Claims

1. A leakage containment system for an underground tank (2) comprising:

   a containment structure (4) of said tank (2) apt to be located in a ground break;
   a tank support base (7) internally located in said containment structure (4), and
   a tank (2) apt to be fixedly arranged on said base (7), the system being **characterised in that** said containment structure (4) is made in flexible material.

2. The leakage containment system for an underground tank according to the preceding claim, wherein said flexible material is a gas- and liquid-proof imputrescible plastics material.

3. The leakage containment system for an underground tank according to the preceding claim, wherein said imputrescible plastics material is selected in the group:

   polyethylene;
   high-density polyethylene;
   polypropylene; and
   PVC, or the like.

4. The leakage containment system for an underground tank according to any one of the preceding claims, further comprising a cathodic protection system with a sacrificial anode (8) and a reference anode (9) internally to said structure (4).

5. The leakage containment system for an underground tank according to any one of the preceding claims, further comprising means (5) for securing said structure (4) onto the surrounding ground.

6. An assembling method of the containment system according to the preceding claims, **characterised in that** it comprises the following steps:

   - implementing a ground break (1) of a substantially parallelepiped shape and of dimensions substantially larger with respect of the overall ones of said tank (2);
   - laying a first layer (3) of sandy material or the like onto the bottom wall of said break (1);
   - positioning a structure (4) made in impermeable and imputrescible flexible material inside of the break (1), and so as to cover every wall thereof (1) and so that a portion of said flexible structure (4) outcrop from the break (1);
   - ground-securing said outcropping portion of the structure (4) with securing means (5) and at the corner areas of said break (1);
   - laying a second layer (6) of sandy material at the bottom portion of said structure (4);
   - arranging a support base (7) of said tank (2) on said second layer (6);
   - positioning and securing said tank (2) on said base (7); and
   - filling up the break (1) with earthy material or the like and inert sand or the like.

7. The assembling method of a containment system according to the preceding claim, **characterised in that** it further comprises the steps of:

   - positioning one or more sacrificial anodes (8) each at a bottom corner area of said break (1) inside of said structure (4); and
   - positioning a reference electrode (9) in an area equal to one half of the total depth of the break (1).

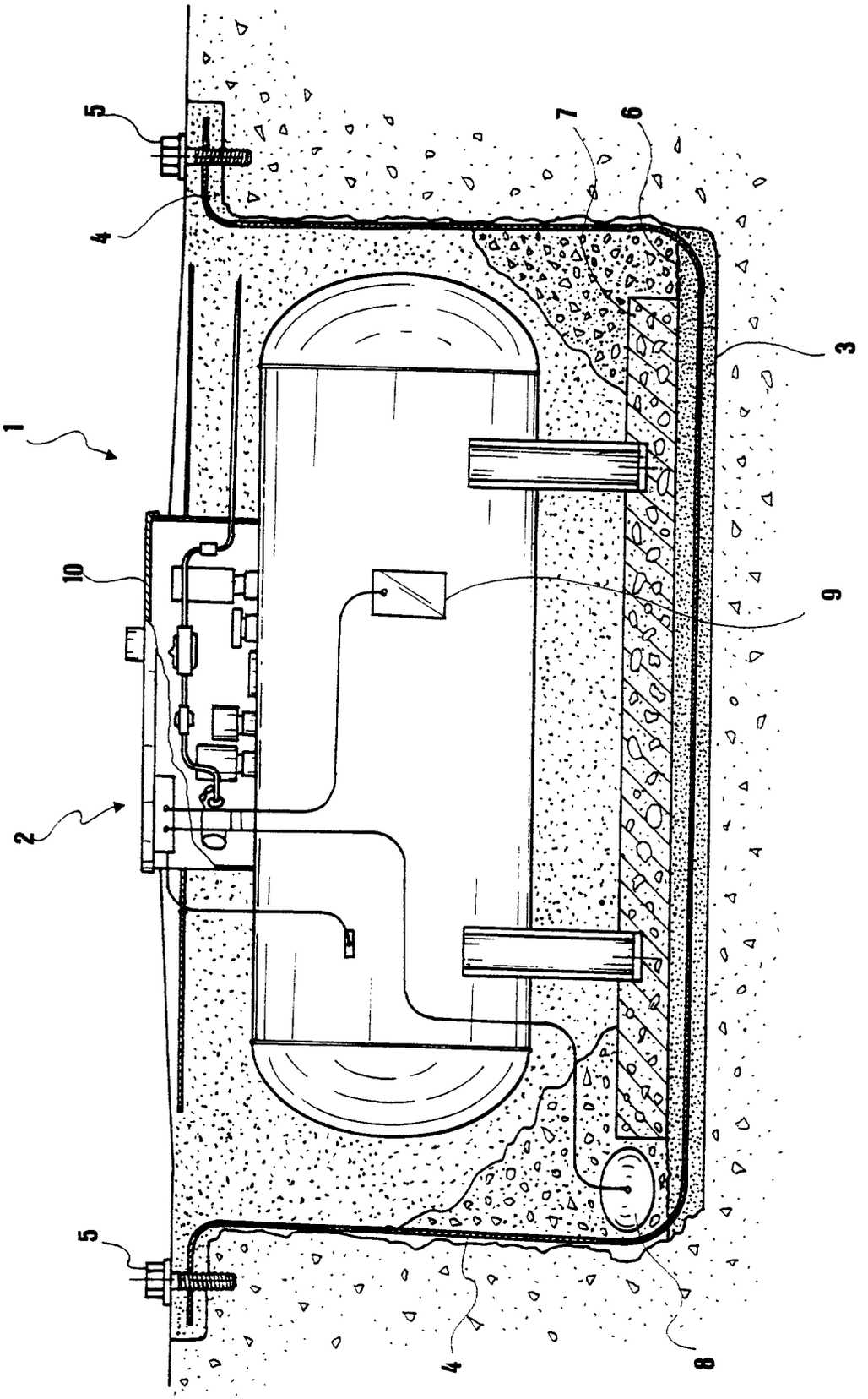

FIG.1

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EUROPEAN SEARCH REPORT

Application Number
EP 01 83 0156

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	US 4 682 911 A (MORELAND JACK) 28 July 1987 (1987-07-28) * abstract; claims; figures * ---	1-3,5,6	B65D90/24
X A	US 4 865 899 A (REICHERT CHARLES R) 12 September 1989 (1989-09-12) * abstract; claims; figures * ---	1-3 6	
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TECHNICAL FIELDS SEARCHED (Int.Cl.7)
B65D B32B E03F

~~The present search report has been drawn up for all claims~~

Place of search	Date of completion of the search	Examiner
THE HAGUE	23 August 2001	VAN ROLLEGHEM, F

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

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Application Number
EP 01 83 0156

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☒ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

1-3, 6

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LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 01 83 0156

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. Claims: 1-3,6

   A LEAKAGE CONTAINMENT SYSTEM

2. Claims: 4,7

   A CATHODIC PROTECTION SYSTEM

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 01 83 0156

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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23-08-2001

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82