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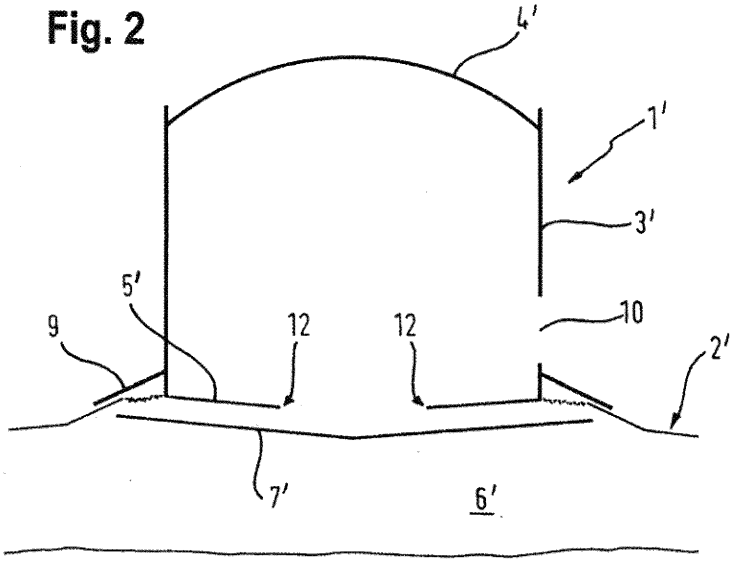
(54) A SYSTEM FOR RE-USE OF A PART OF A USED OIL STORAGE TANK AND ITS FOUNDATION AS WELL AS A METHOD FOR FACILITATING SUCH RE-USE; A METHOD FOR CUTTING A STEEL OIL STORAGE TANK BOTTOM PLATE AND A SYSTEM FOR STORING OIL IN AN ENVIRONMENTALLY FRIENDLY WAY

(57) A system for re-use of a part of a used oil storage tank and its foundation, wherein the system comprises at a location: a used oil storage tank wall, and a used foundation, the foundation comprising soil and a used foil embedded in the soil for ensuring that oil does not leak through to the soil underneath the foil, the system being made free from at least a part of a used oil storage tank bottom plate as a result of producing cut surfaces as part of the system, the cut surfaces being used, or useable, for welding of at least a part of a new oil storage tank bottom plate into the system, the foil still being useable for ensuring that oil will not leak through to the soil underneath the foil.

Fig. 2



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Description

Introduction

[0001] The invention relates to a system for re-use of a part of a used oil storage tank and its foundation. The invention further relates to a method for facilitating re-use of a part of a used oil storage tank and its foundation. The invention also relates to a method for cutting a steel oil storage tank bottom plate and to a system for storing oil in an environmentally friendly way.

[0002] Oil storage tanks are relatively large constructions, comprising: an oil storage tank bottom plate; an oil storage tank wall which is usually closed in itself and has the shape of a huge cylinder; and a rooftop. The oil storage tank wall is often referred to as the shell. The oil storage tank wall and the bottom plate are usually made of steel. An oil storage tank is often situated on a foundation which may be of concrete or of a well-prepared soil, such as one comprising a bedding of sand. Such a bedding of sand may be based on soil sand, sand formed by crushed stones, bitumen sand (also referred to as asphalt) or normal river sand. The thickness of the bedding of sand is about 10 cm. Underneath this bedding, foil is often embedded in the soil for ensuring that oil will not leak through to the soil located underneath the foil. Such a leakage can of course only occur if the oil in the first place leaked through the bottom plate out of the oil storage tank into the bedding.

[0003] Regulations are often in place to ensure that cleaning the soil or replacing the soil takes place once leakage has been detected.

[0004] In principle there are two different ways for erecting an oil storage tank. One method is often referred to as the so-called "jacking method" which starts off with placing a roof on top of the foundation. The roof is then jacked up and a part of the cylindrical oil tank wall will be placed under the roof. Then this cylindrical oil storage tank wall with the roof on top will be jacked up and another part of the cylindrical oil storage tank wall will be placed under the part that has been jacked up. This continues till the intended height of the oil storage tank wall has been reached. Then the oil storage tank bottom plate will be placed between the foundation and the cylindrical oil storage tank wall. Finally, the oil storage tank wall and the bottom plate will be resting on the foundation. The oil storage tank wall parts and the oil storage tank bottom plate are during well-defined stages available throughout this process welded together.

[0005] The other method for building an oil storage tank is the so-called "stacking method". After building the foundation, the oil storage bottom plate will be placed on the foundation. Then a cylindrical part of the oil storage tank wall will be placed on the bottom plate. After that, another cylindrical part of the oil storage tank wall will be placed on the previously positioned cylindrical part of the oil storage tank wall. This process continues till the intended height of the oil storage tank wall has been reached. Then the oil storage tank roof will be placed on top. Also throughout this process well-defined stages are available during which the oil storage tank bottom plate and the oil storage tank wall parts will be welded together.

[0006] Of course, the methods described so far have been simplified to a great extent. Much welding needs to take place during each of the methods. The jacking method needs jacking equipment. The stacking method needs hoisting equipment. In any case, building an oil storage tank is labour-intensive, time-consuming and costly.

[0007] The methods have in common that the foundation will first be built, that is, the soil is prepared, the foil is placed and the bedding of sand is put on the foil. Building a foundation is equally labor-intensive, time-consuming and costly. This would be even more the case when for this work at least a part of the oil storage tank would need to be jacked up.

[0008] Although the foundation could also be made of concrete as indicated above, this option will not be discussed in detail as the presently presented invention is more suitable for use for foundations which comprise a bedding of sand and a foil.

Background of the invention

[0009] As with any other construction, wear of the construction needs to be addressed. As the oil storage tank is usually made of steel plates, corrosion deserves special attention. Very specialized coating techniques are available and are widely applied to the surfaces of the oil storage tank. Even the inside surfaces can be coated when for a period of time no oil is stored in the tank. However, the oil storage tank bottom plate can only be treated on one side, namely the upper side. One could therefore consider the oil storage tank bottom plate as a part that is especially prone to corrosion. A special detection system has been designed for detecting leakage of oil out of the tank through the bottom plate. Once the presence of any oil has been detected under the bottom plate, then, clearly, the oil storage tank needs to be emptied by pumping the oil out of the tank. The bottom plate then needs to be replaced by a new bottom plate. The bedding of sand on which the oil tank rests may also need to be renewed.

[0010] As residues of oil and/or oil vapors are still likely to be present in the soil directly underneath the oil storage tank, removal of the storage tank bottom plate cannot be done by means of spark - and/or heat generating equipment. Instead, use is made of a cutting medium which is based on a beam of highly pressurized water enriched with abrasive grit particles. The cutting beam, however, destroys the bedding of sand in the foundation, penetrates through this foundation and damages the foil so badly that the foil no longer can prevent leakage of oil to the soil underneath the foil. Then, the oil storage tank wall needs to be jacked up so that the polluted soil and the foil can be removed, replaced by clean soil, respectively a new foil, and the foundation can be re-made. This

is, as outlined above, a labor-intensive, time-consuming and costly process during which the oil storage tank is not in use. A solution to this problem has for a long time not been offered.

Object of the invention

[0011] It is an object of the invention to provide a system for re-use of a part of a used oil storage tank and its foundation so that the re-use can be relatively fast. It is a further object of the invention to provide a method for facilitating re-use of a part of a used oil storage tank and its foundation so that the re-use can be relatively fast.

Summary of the invention

[0012] The invention provides for a system for re-use of a part of a used oil storage tank and its foundation, wherein the system comprises at a location: a used oil storage tank wall; and a used foundation. The foundation comprises soil and a used foil embedded in this soil for ensuring that oil does not leak through to the soil located underneath the foil. The system is made free from at least a part of a used oil storage tank bottom plate as a result of producing cut surfaces as part of the system. The cut surfaces are used, or are usable, for welding of at least a part of a new oil storage tank bottom plate into the system. The foil is still usable for ensuring that oil will not leak through to the soil underneath the foil.

[0013] This system according to the invention is a result of the insight that the bottom plate can be removed by a cutting method that does not penetrate through the foil in the foundation, and that does at the same time offer the possibility to rapidly install a new bottom plate.

[0014] Advantageously and accordingly, such a system is much faster ready for re-use. Welding a new oil storage tank bottom plate into such a system can take place without much further preparation. Use can be made of the cut surfaces of the system. As the foil is still usable for ensuring that oil will not leak through to the soil underneath the foil, the foundation does not need to be redone in its entirety. If anything, the sand of the bedding, in which also some oil may be present due to leakage from the storage tank, might need to be replaced. However, the cumbersome activity of removing the existing foil and "installing" new foil, for which also the oil storage tank wall will need to be jacked up as the foil will need to extend beyond the circumference of that wall, can be dispensed with. This saves a lot of time and costs.

[0015] Further, as indicated above and now explained in more detail, the presence of the cut surfaces as part of the system and used or usable for welding of at least a part of a new oil storage tank bottom plate into the system, facilitates a swift re-use of the oil storage tank. Having these cut surfaces as a remainder of the freeing up of the used oil storage tank from the used oil storage tank bottom plate ensure that the system is, after preparing a new foundation - if needed at all, ready for using a new oil storage tank bottom plate without significant further preparations. Had the system been made free without the production of these cut surfaces, then no surfaces would be directly available for use for welding of a new oil storage tank bottom plate into the system. Additional preparatory work would delay the re-functioning of the oil storage tank and increase the costs.

[0016] The invention further provides a method for facilitating re-use of a part of a used oil storage tank and its foundation, wherein at the location: a used oil storage tank wall is in position for forming part of an oil storage tank; a used oil storage tank bottom plate is in position for being a bottom of the oil storage tank; and a foundation is in place for supporting the oil storage tank. The foundation comprises soil and a foil embedded in the soil for ensuring that oil which has leaked through the oil storage tank bottom plate into the soil above the foil, will not leak through to the soil underneath the foil. The method comprises removing at least a part of the oil storage tank bottom plate by means of producing cut surfaces as part of the system in such a way that the cut surfaces are usable for welding of at least a part of a new oil storage tank bottom plate into the system and in such a way that the foil remains usable for ensuring that oil will not leak through to the soil underneath the foil.

[0017] Advantageously, this method speeds up re-use of a part of a used oil storage tank and its foundation, in line with arguments put forward above in relation to the invented system.

[0018] In an embodiment of a method according to the invention, removing the oil storage tank bottom plate comprises cutting the oil storage tank bottom plate in small loose parts for removing these to a position outside the oil storage tank wall. Such smaller parts can be taken out of the oil storage tank without the need for producing a large exit route out of the oil storage tank. A relatively small hole in the tank wall will be sufficient for entrance of the cutting equipment into the tank and exit of those loose freshly-cut parts of the bottom plate out of the tank.

[0019] In an embodiment of the method according to the invention, at least a number of the cut surfaces are part of the used oil storage tank wall and/or part of a remainder of the oil storage tank bottom plate. This facilitates, in case the cut surfaces are part of the used oil storage tank wall, a complete replacement of the oil storage tank bottom plate. On the other hand, in case the cut surfaces are part of a remainder of the oil storage tank bottom plate, this facilitates replacing only those parts of the oil storage tank bottom plate which were no longer in a good condition and needed to be replaced. Other parts which are still in a very good condition, can be maintained for functioning as a part of the newly-prepared oil storage tank bottom plate.

[0020] In an embodiment of a method according to the invention, the method is carried out such that the used oil storage tank wall remains in a position for forming part of the oil storage tank. In such a method, there is no need to have hoisting or jacking equipment. Thus, the method

is less risky, less labor-intensive, less time-consuming and therefore less costly. It is possible, for instance, as indicated above, to cut a relatively small opening in the oil storage tank wall for entrance of cutting equipment into the oil storage tank and for removing loose cut parts of the oil storage tank bottom plate and the cutting equipment again out of the oil storage tank. Alternatively, use is made of a manhole that may be present in the oil storage tank wall.

[0021] In an embodiment of a method according to the invention, removing the oil storage tank bottom plate comprises cutting the oil storage tank bottom plate using an abrasive medium. This tends to be a method which is free from generating sparks and/or heat, so that there is no chance of fire and/or explosions by interactions of any sparks and/or heat with residues of oil in the soil directly under the oil storage tank bottom plate.

[0022] In an embodiment of a method according to the invention, the medium comprises a beam of water, preferably enriched with grit particles. Such a medium is environmentally friendly, also acts as a coolant, and is relatively cheap in operation, especially as risks for any workers are low and labor costs can be kept reasonably low.

[0023] In an embodiment of a method according to the invention, the oil storage tank bottom plate has a centrally positioned lowest part. This means that any forces introduced by the gravity of the oil storage tank wall and roof and absorbed by the oil storage tank bottom plate , are partly conducted away within the bottom plate to the centrally positioned lowest part. This allows for applying a very sophisticated method that would facilitate maintenance of the foundation and the foil embedded in the soil of the foundation.

[0024] In an embodiment of a method according to the invention, the gap of a cut made during cutting has a width which is so small that the width of the gap is narrowed or the gap is closed due to release of stresses of the oil storage tank bottom plate. This has the advantage that water can no longer that easily disappear through the gap into the soil of the foundation. Thus, any damage to the foundation will be minimized. This method is particularly useful when applied before any oil has leaked out of the oil storage tank through the bottom plate into the foundation. As this method ensures that the foundation, i.e. sand bedding remains in good condition, and no leakage has taken place, only the bottom plate needs to be replaced or partly be renewed.

[0025] In an embodiment of a method according to the invention, the water beam is produced by a nozzle having a diameter which is less than about 0.45mm, for instance a diameter in a range down to 0.2 mm. This has shown to produce a gap which can be closed after its production by release of stresses within the plate that is being cut.

[0026] In a method according to an embodiment of the invention, a velocity of the nozzle along a surface of the oil storage tank bottom plate is such that the plate is just about to be cut through. Advantageously, also in this embodiment water is blocked from reaching the foundation, so that again any damage to the foundation will be minimal. Also, this method is particularly useful when applied before any oil has leaked out of the oil storage tank through the bottom plate into the foundation. The foundation is then still in an unpolluted and good condition so that re-use of the oil storage tank is possible after a swift reinstalment of a new oil storage tank bottom plate, without having had to also replace part of or the complete foundation.

[0027] The invention further provides a method for cutting a steel oil storage tank bottom plate of an oil storage tank, comprising producing in the steel bottom plate a cut so that the gap is formed between two parts of the steel bottom plate. The gap has a width so small that due to stresses present in the steel oil storage tank bottom plate the width of the gap is narrowed, or the gap is fully closed.

[0028] The invention will now be further explained in a non-limiting way and with reference to the drawing, which shows in:

Figure 1, schematically an oil storage tank related to the invention;

Figure 2, an embodiment of a system according to the invention;

Figure 3, an embodiment of a system according to the invention;

Figure 4, an embodiment of a system according to the invention;

Figure 5, a top view on a cut made in a bottom plate of an oil storage tank in accordance with a first embodiment of a method according to the invention;

Figure 6, schematically a side view of an oil storage tank bottom plate as being cut in accordance with an embodiment of a method according to the invention;

Figure 7, schematically an oil storage tank and its foundation as an embodiment of a system according to an aspect of the invention.

[0029] The drawing is schematically depicting embodiments of the various aspects of the invention. Like references denote like parts.

[0030] Figure 1 shows as a further introduction to the invention an oil storage tank 1 on its foundation 2. The oil storage tank 1 comprises an oil tank wall 3, an oil storage tank roof 4 and an oil storage tank bottom plate 5. The foundation 2 comprises soil 8 and a foil 7, embedded in the soil 6. The oil storage tank bottom plate 5 tends to have a centrally positioned lowest part 11. The bottom plate 5 has been constructed in that way, so that on pump-

ing out the oil storage tank the final rest of oil will always find that lowest position 11 in the tank. That final residue of oil can easily be pumped out of the tank as it is known where it will be just before the tank is fully emptied out. The foil 7 is embedded in the soil 6. Above the foil and underneath the bottom plate 5 there is a bedding of sand 8 as part of the soil and as part of the foundation 2. Should the bottom plate 5 start allowing for leakage of some oil out of the oil storage tank 1, then this oil will be prevented from leaking through to the soil below the foil as the foil is not permeable to oil. The actual circumference of the oil storage tank just outside the oil storage tank wall 3 may in many situations be different than shown. However, this is not relevant for explaining the present invention. In any case, normally there is a roof-like part 9 that extends radially further than the outer circumference of the foil 7, so as to avoid that rain water running down from the oil storage tank wall will end up in the bedding of sand 8 and also be collected by the foil 7.

[0031] Figure 2 shows an embodiment of a system according to the invention for re-use of a part of a used oil storage tank and its foundation. As can be seen, the system comprises at a location a used oil storage tank wall 3' and a used foundation 2'. The foundation 2' comprises soil 6' and a used foil 7' embedded in the soil 6' for ensuring that oil does not leak through to the soil 6' underneath the foil 7'. As can be seen, the system is made free from at least a part of the used oil storage tank bottom plate. This is a result of producing cut surfaces 12 as part of the system. Possible ways of producing such cut surfaces 12 are discussed below. The cut surfaces 12 are usable for welding of at least a part of a new oil storage tank bottom plate into the system. The foil 7', although being used, is still usable for ensuring that oil will not leak through to the soil underneath the foil 7'. It is understood that cut surfaces 12 which are usable for welding of at least a part of a new oil storage tank bottom plate into the system, do not necessarily need to be machined, or otherwise treated, to change the geometry and/or composition of these surfaces before a part of the new oil storage tank bottom plate can be welded into the system. Although these cut surfaces 12 may themselves be used for welding a part of an oil storage tank bottom plate against, it may equally be the case that a new oil storage tank bottom plate is positioned such that there is overlap between the remaining parts of the used old storage tank bottom plate and the new oil storage tank bottom plate parts. Thus, welding does not necessarily need to take place at the cut surfaces 12. It may in case of such overlap be more appropriate to weld edges of a new part of the bottom plate at the upper side of the remaining parts of the used oil storage tank bottom plate. In any case, it is possible that at least a number of the cut surfaces 12 are, as shown in Figure 2, part of the used oil storage tank bottom plate.

[0032] Turning now to Figure 3, an embodiment is shown in which at least a number of the cut surfaces 12 are part of the used oil storage tank wall 3. The system shown in Figure 3 is made fully free from a used oil storage tank bottom plate.

[0033] It applies to both Figure 2 and 3 that the oil storage tank wall 3' is at the location positioned at a height it had during use as part of a used oil storage tank when that tank was in use. The equipment for cutting partly or entirely the used oil storage tank bottom plate 5' can be entered into the tank by an opening 10 in the tank wall 3', particularly made for that purpose. The parts of the oil storage tank bottom plate as cut out of the used oil storage tank bottom plate 5' can also be carried out of the oil storage tank 1 via the opening 10 which is often referred to as a door-sheet.

[0034] Figure 4 shows an alternative embodiment wherein the oil storage tank wall 3' is at the location positioned at a height which is higher than a position it had during use as part of the used oil storage tank 1' when that tank was in use. Although no jacking equipment is shown, it is likely that the oil storage tank wall is jacked up. Only for very small oil storage tanks it may be possible to lift the oil storage tank wall up using hoisting equipment.

[0035] It applies to both the embodiments shown in Figure 3 and the embodiments shown in Figure 4 that the bedding of sand 8 also has been removed. This occurs when oil residues were present in that bedding of sand 8. However, used foil 7' remains part of these embodiments. The embodiments shown in Figures 2, 3 and 4 show the used oil storage tank roof 4'.

[0036] It is emphasized that the drawing as shown of each of the Figures, is only schematical. For instance, the bedding of sand 8, 8' would normally have a depth of about 10cm. On the other hand, the height of an oil storage tank may easily be in the order of 10 to 30 meters.

[0037] We now discuss the following method for facilitating re-use of a part of a used oil storage tank 1' and its foundation 6'. At the location, a used oil storage tank 3' is in position for forming part of an oil storage tank 1. At the location is further in position a used oil storage tank bottom plate 5' for being a bottom for the oil storage tank 1. At the position is in place a foundation 2' for supporting the oil storage tank 1. The foundation 2' comprises soil 6' and a foil 7' embedded in the soil 6' for ensuring that oil which has leaked through the oil storage tank bottom plate 5 into soil (bedding of sand 6) above the foil, will not leak through to the soil 6' underneath the foil 7'.

[0038] The method comprises removing at least a part of the oil storage tank bottom plate 5' by means of producing cut surfaces 12 as part of the system in such a way that the cut surfaces 12 are usable for welding of at least part of a new oil storage tank bottom plate into the system and in such a way that the foil 7' remains usable for ensuring that oil will not leak through to the soil 6' underneath the foil 7'. At least a number of the cut surfaces 12 may be part of the used oil storage tank wall 3. However, alternatively, or also additionally, it is possible that at least a number of cut surfaces 12 are part of a

remainder of the oil storage tank bottom plate 5'.

[0039] The method may be carried out such that the used oil storage tank wall 3' remains in a position for forming part of the oil storage tank 1'. Thus, throughout removing the oil storage tank bottom plate, partly or completely, the oil storage tank wall 3' remains positioned at a height it had during use as part of the used oil storage tank when that tank was in use.

[0040] However, alternatively it is possible that throughout removing the oil storage tank bottom plate 5' partly or completely, the oil storage tank wall 3' is at a position which is higher than a position it had during use as part of the used oil storage tank 1' when that tank was in use.

[0041] Ideally, removing the oil storage tank bottom plate, partly or completely, comprises cutting the oil storage tank bottom plate, partly or completely, in small loose parts for removing these to a position outside the oil storage tank wall 3'. Removing the oil storage tank bottom plate, partly or completely, comprises cutting the oil storage tank bottom plate using an abrasive medium. The medium may comprise a beam of a highly-pressurized water, preferably enriched with grit particles, for instance made of natural or synthetic fragments of diamond. As explained above, the oil storage tank bottom plate 5, 5' has a centrally positioned lowest part 11.

[0042] Preferably, as schematically illustrated in Figure 5, a gap of a cut made during cutting has a width which is so small that the width of the gap is narrowed or the gap is fully closed due to release of stresses in the oil storage tank bottom plate. Such stresses are present as a result of the weight of the oil storage tank wall and roof. These gravitational forces are at least to an extent carried through along the plate direction of the bottom plate. Advantages of this method will be explained further below.

[0043] The water beam is preferably produced by nozzle having a diameter which is less than about 0.45mm, preferably a diameter in a range down to 0.2 mm. The water volume used for producing the beam may be 3 to 4 liters per minute. Preferably, this is even less, for instance a volume flow within a range down to as low as 0.5 liters per minute. The beam may leave traces up to a depth of 0.1 to 9 cm from a lower side of the oil storage tank bottom plate. Preferably, this is even less, for instance 0.1 cm to at most 5 cm.

[0044] Alternatively, a velocity of the nozzle 13 along a surface of the oil storage tank bottom plate is such that the plate is just about to be cut through. In an embodiment of a method wherein a velocity of the nozzle 13 along a surface of the oil storage tank bottom plate 5' is such that the plate is just not fully cut through along its thickness, the method is preferably carried out such that a remaining connection between parts of the cut oil storage tank bottom plate positioned at opposite sides of the cut will break under influence of forces generated by the weight of at least one of the respective parts.

[0045] We now discuss a method for cutting a part 5 of steel oil storage tank bottom plate of an oil storage tank, comprising producing in the steel bottom plate a cut so that a gap is formed between two parts of the steel bottom plate. The gap has a width so small that due to stresses present in the steel oil storage tank bottom plate the width of the gap is narrowed, or the gap is fully closed. This is illustrated in Figure 5. A cutter (not shown) is moving in the direction of arrow V. The arrows P show a direction of movement of the freshly-cut surfaces 12. Preferably, cutting comprises using an abrasive medium. The medium preferably comprises a beam of water, preferably enriched with grit particles, for instance based on natural or synthetic diamond fragments. The water beam may be produced by a nozzle having a diameter which is less than 0.45mm, for instance a diameter in a range down to 0.2 mm. Preferably, the water volume used for producing the beam is 3 to 4 liters per minute, or even much less, for instance a volume flow in a range down to 0.5 liters per minute.

[0046] Figure 6 shows in a schematic side and cross-sectional view that water W flows back to above the plate that is being cut. As the width of the gap narrows, and often is fully closed, not much water, if any, flows into the bedding of sand 8'. The bedding may then not need to be fully replaced, particularly if no oil residues had leaked into the bedding.

[0047] Finally, attention is drawn to Figure 7 showing a system for storing oil in an environmentally friendly way. The system comprises an oil storage tank 1 and a foundation 2 for the oil storage tank 1. The foundation 2 comprises soil 6 and a foil 7 embedded in the soil for preventing oil from leaking through to the soil 6 and then into foil 7. The system comprises a first oil detection system 15 positioned in the soil 6 above the foil 7 and a second oil detection system 16 positioned in the soil 6 underneath the foil 7. Each oil detection system 15, 16 allows for a communication, in the broadest technically feasible sense, with a position outside the foundation 2 and outside the oil storage tank 1. This communication is schematically depicted by line 15', respectively 16'. The communication may allow for the physical taking of a sample out of a collector 17, 18 of the oil detection system 15, 16. This system allows for initially detecting when bottom plate 5 of the oil storage tank 1 is leaking, as oil detection system 15 may via communication 15' flag up that oil has been collected in oil collector 17. When, as explained higher up in the present disclosure, at least a part of bottom plate 5 of the oil storage tank 1 has been removed and replaced, ideally an assessment is made as to whether the foil 7 needs to be replaced. Should any oil have been detected by oil detection system 16, then also foil 7 would need to be replaced. However, should no oil have been detected by oil detection system 16, then it may be decided that foil 7 is still suitable for ensuring that no oil will be leaking through foil 7 into the soil underneath foil 7. Oil detection 16 may also be replaced by another type of liquid detection system so that after removing bottom plate 5 of the oil storage tank, one can test, for

instance with water, whether foil 7 is still intact. Then, oil detection 16 positioned in the soil underneath the foil would equally be suitable for detecting water. Of course, if the oil detection systems work on the basis of taking a sample, then it is very possible to decide swiftly if, and if so, what has been leaking through into the respective detection system.

[0048] The system may thus comprise a first liquid detection system positioned in the soil above the foil and may comprise a second liquid detection system positioned in the soil underneath the foil. The first liquid detection system may be arranged to allow for detection of oil and/or water. The second liquid detection system may be arranged to allow for detection of oil and/or water.

[0049] Many modifications of the invention are thus possible, within the scope of the present disclosure.

[0050] The following numbered items provide further disclosure of the present subject matter.

1. A system for re-use of a part of a used oil storage tank and its foundation, wherein the system comprises at a location:

    a used oil storage tank wall; and
    a used foundation,
    the foundation comprising soil and a used foil embedded in the soil for ensuring that oil does not leak through to the soil underneath the foil,
    the system being made free from at least a part of a used oil storage tank bottom plate as a result of producing cut surfaces as part of the system, the cut surfaces being used, or useable, for welding of at least a part of a new oil storage tank bottom plate into the system, the foil still being useable for ensuring that oil will not leak through to the soil underneath the foil.

2. A system according to item 1, wherein at least a number of the cut surfaces are part of the used oil storage tank wall and/or part of a remainder of a used oil storage tank bottom plate.

3. A system according to item 1 or 2, wherein the oil storage tank wall is at the location positioned at a height it had during use as part of a used oil storage tank when that tank was in use.

4. A system according to item 2, wherein the oil storage tank wall is at the location positioned at a height which is higher than the position it had during use as part of a used oil storage tank when that tank was in use.

5. A system according to any one of items 1-4, wherein the system comprises at least one oil detection system.

6. A system according to item 5, wherein one of the at least one oil detection system is positioned in the soil underneath the foil.

7. A system according to item 5 or 6, wherein one of the at least one oil detection system is positioned in the soil above the foil.

8. A system according to any one of the items 1-7, wherein the system further comprises at the location a used oil storage tank roof, positioned near an upper part of the oil storage tank wall.

9. A system according to any one of the previous items, wherein the soil above the foil comprises a bedding of sand.

10. A system according to item 9, wherein the bedding has a depth of about 10 cm.

11. Method for facilitating re-use of a part of a used oil storage tank and its foundation, wherein at the location:

    a used oil storage tank wall is in a position for forming part of an oil storage tank;
    a used oil storage tank bottom plate is in a position for being a bottom for the oil storage tank; and
    a foundation is in place for supporting the oil storage tank, the foundation comprising soil and a foil embedded in the soil for ensuring that oil which has leaked through the oil storage tank bottom plate into soil above the foil, will not leak through to the soil underneath the foil,

the method comprising:

    removing at least a part of the oil storage tank bottom plate by means of producing cut surfaces as part of the system in such a way that the cut surfaces are useable for welding of at least a part of a new oil storage tank bottom plate into the system and in such a way that the foil remains useable for ensuring that oil will not leak through to the soil underneath the foil.

12. Method according to item 11, wherein at least a number of the cut surfaces are part of the used oil storage tank wall and/or part of a remainder of the oil storage tank bottom plate.

13. Method according to item 11 or 12, wherein the method is carried out such that the used oil storage tank wall remains in a position for forming part of the oil storage tank.

14. Method according to item 11, 12 or 13, wherein throughout removing the oil storage tank bottom

plate the oil storage tank wall remains positioned at a height it had during use as part of the used oil storage tank when that tank was in use.

15. Method according to any one of items 11-13, wherein throughout removing the oil storage tank bottom plate the oil storage tank wall is at a position which is higher than the position it had during use as part of the used oil storage tank when that tank was in use.

16. Method according to any one of items 11-15, wherein removing the oil storage tank bottom plate comprises cutting the oil storage tank bottom plate in small loose parts for removing these to a position outside the oil storage tank wall.

17. Method according to any one of items 11-16, wherein removing the oil storage tank bottom plate comprises cutting the oil storage tank bottom plate using an abrasive medium.

18. Method according to item 17, wherein the medium comprises a beam of highly pressurized water, preferably enriched with grit particles.

19. Method according to any one of items 11-18, wherein the oil storage tank bottom plate has a centrally positioned lowest part.

20. Method according to item 19, wherein a gap of a cut made during cutting has a width which is so small that the width of the gap is narrowed or the gap is closed due to release of stresses in the oil storage tank bottom plate.

21. Method according to item 20, wherein the water beam is produced by a nozzle having a diameter which is less than about 0,45 mm, or preferably a diameter in a range down to 0.2 mm.

22. Method according to item 20 and 21, wherein the water volume used for producing the beam is 3 to 4 liters per minute, preferably less, for instance a volume per minute of a value in a range down to 0.5 liters per minute.

23. Method according to any one of items 18-22, wherein the beam leaves traces up to a depth of 0.1 to 9 cm from a lower side of the oil storage tank bottom plate, or preferably traces up to a depth of 0.1 to at most 5 cm.

24. Method according to any one of items 21-23, wherein a velocity of the nozzle along a surface of the oil storage tank bottom plate is such that the plate is just about to be cut through.

25. Method according to any one of items 21-23, wherein a velocity of the nozzle along a surface of the oil storage tank bottom plate is such that the plate is just not fully cut through along its thickness, and such that a remaining connection between parts positioned at opposite sides of the cut will break under influence of forces generated by the weight of at least one of the respective parts.

26. A method for cutting a steel oil storage tank bottom plate of an oil storage tank, comprising producing in the steel bottom plate a cut so that a gap is formed between two parts of the steel bottom plate, wherein the gap has a width so small that due to stresses present in the steel oil storage tank bottom plate the width of the gap is narrowed, or the gap is fully closed.

27. Method according to item 26, wherein cutting comprises using an abrasive medium.

28. Method according to item 27, wherein the medium comprises a beam of water, preferably enriched with grit particles.

29. Method according to item 28, wherein the water beam is produced by a nozzle having a diameter which is about 0.45mm, or preferably a diameter in a range down to 0.2 mm.

30. Method according to item 28 and/or item 29, wherein the water volume used for producing the beam is 3 to 4 liters per minute, preferably less, for instance a volume per minute of a value in a range down to 0.5 liters per minute.

31. System for storing oil in an environmentally friendly way, wherein the system comprises an oil storage tank and a foundation for the oil storage tank, the foundation comprising soil and a foil embedded in the soil for preventing oil from leaking through to the soil underneath the foil, wherein the system further comprises a first liquid detection system positioned in the soil above the foil and a second liquid detection system positioned in the soil underneath the foil.

32. System according to item 31, wherein the first liquid detection system is arranged to allow for detection of oil and/or water.

33. System according to item 31 or 32, wherein the second liquid detection system is arranged to allow for detection of oil and/or water.

Claims

1. A system for re-use of a part of a used oil storage tank and its foundation, wherein the system comprises at a location:

   a used oil storage tank wall; and
   a used foundation,
   the foundation comprising soil and a used foil embedded in the soil for ensuring that oil does not leak through to the soil underneath the foil,
   the system being made free from at least a part of a used oil storage tank bottom plate as a result of producing cut surfaces as part of the system,
   the cut surfaces being used, or useable, for welding of at least a part of a new oil storage tank bottom plate into the system, the foil still being useable for ensuring that oil will not leak through to the soil underneath the foil.

2. A system according to claim 1, wherein at least a number of the cut surfaces are part of the used oil storage tank wall and/or part of a remainder of a used oil storage tank bottom plate.

3. A system according to claim 1 or 2, wherein the oil storage tank wall is at the location positioned at a height it had during use as part of a used oil storage tank when that tank was in use, or wherein the oil storage tank wall is at the location positioned at a height which is higher than the position it had during use as part of a used oil storage tank when that tank was in use.

4. A system according to any one of claims 1-3, wherein the system comprises at least one oil detection system,
   wherein preferably one of the at least one oil detection system is positioned in the soil underneath the foil.

5. Method for facilitating re-use of a part of a used oil storage tank and its foundation, wherein at the location:

   a used oil storage tank wall is in a position for forming part of an oil storage tank;
   a used oil storage tank bottom plate is in a position for being a bottom for the oil storage tank; and
   a foundation is in place for supporting the oil storage tank, the foundation comprising soil and a foil embedded in the soil for ensuring that oil which has leaked through the oil storage tank bottom plate into soil above the foil, will not leak through to the soil underneath the foil,
   the method comprising:

   removing at least a part of the oil storage tank bottom plate by means of producing cut surfaces as part of the system in such a way that the cut surfaces are useable for welding of at least a part of a new oil storage tank bottom plate into the system and in such a way that the foil remains useable for ensuring that oil will not leak through to the soil underneath the foil.

6. Method according to claim 5, wherein at least a number of the cut surfaces are part of the used oil storage tank wall and/or part of a remainder of the oil storage tank bottom plate.

7. Method according to claim 5 or 6, wherein throughout removing the oil storage tank bottom plate the oil storage tank wall remains positioned at a height it had during use as part of the used oil storage tank when that tank was in use, or
   wherein throughout removing the oil storage tank bottom plate the oil storage tank wall is at a position which is higher than the position it had during use as part of the used oil storage tank when that tank was in use.

8. Method according to any one of claims 5-7, wherein the oil storage tank bottom plate has a centrally positioned lowest part, and wherein preferably a gap of a cut made during cutting has a width which is so small that the width of the gap is narrowed or the gap is closed due to release of stresses in the oil storage tank bottom plate.

9. A method for cutting a steel oil storage tank bottom plate of an oil storage tank, comprising producing in the steel bottom plate a cut so that a gap is formed between two parts of the steel bottom plate, wherein the gap has a width so small that due to stresses present in the steel oil storage tank bottom plate the width of the gap is narrowed, or the gap is fully closed.

10. Method according to any one of claims 5-9, wherein producing cut surfaces or cutting comprises cutting the oil storage tank bottom plate using an abrasive medium, wherein preferably the medium comprises a beam of highly pressurized water, preferably enriched with grit particles.

11. Method according to claim 10, wherein the water beam is produced by a nozzle having a diameter which is less than about 0,45 mm, or preferably a diameter in a range down to 0.2 mm, and/or wherein the water volume used for producing the beam is 3 to 4 liters per minute, preferably less, for instance a volume per minute of a value in a range down to 0.5 liters per minute.

12. Method according to any one of claims 5-11, wherein the beam leaves traces up to a depth of 0.1 to 9 cm from a lower side of the oil storage tank bottom plate, or preferably traces up to a depth of 0.1 to at most 5 cm.

13. Method according to any one of claims 11 and 12, wherein a velocity of the nozzle along a surface of the oil storage tank bottom plate is such that the plate is just about to be cut through, or wherein a velocity of the nozzle along a surface of the oil storage tank bottom plate is such that the plate is just not fully cut through along its thickness, and such that a remaining connection between parts positioned at opposite sides of the cut will break under influence of forces generated by the weight of at least one of the respective parts.

14. System for storing oil in an environmentally friendly way, wherein the system comprises an oil storage tank and a foundation for the oil storage tank, the foundation comprising soil and a foil embedded in the soil for preventing oil from leaking through to the soil underneath the foil, wherein the system further comprises a first liquid detection system positioned in the soil above the foil and a second liquid detection system positioned in the soil underneath the foil.

15. System according to claim 14, wherein the first liquid detection system is arranged to allow for detection of oil and/or water, and/or wherein the second liquid detection system is arranged to allow for detection of oil and/or water.

Fig. 1

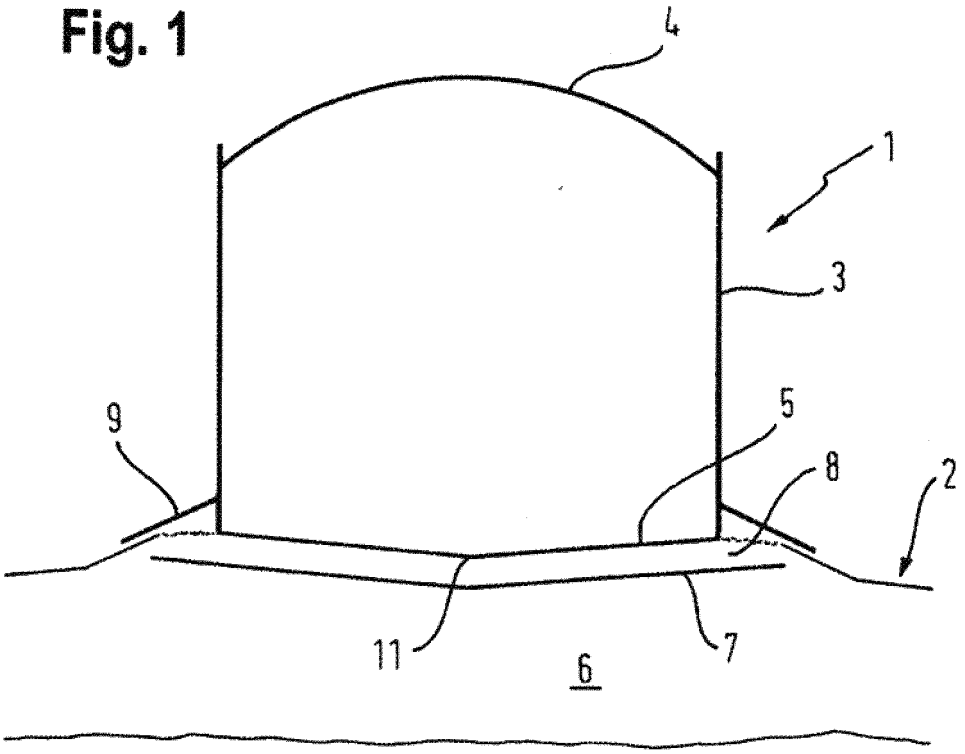

Fig. 2

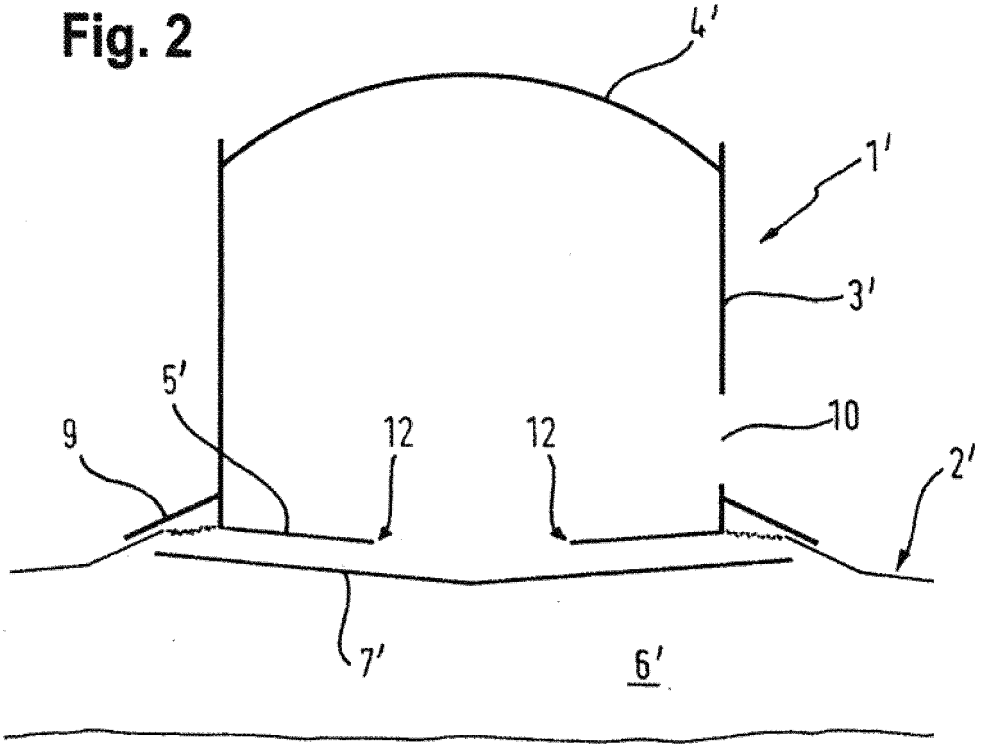

Fig. 3

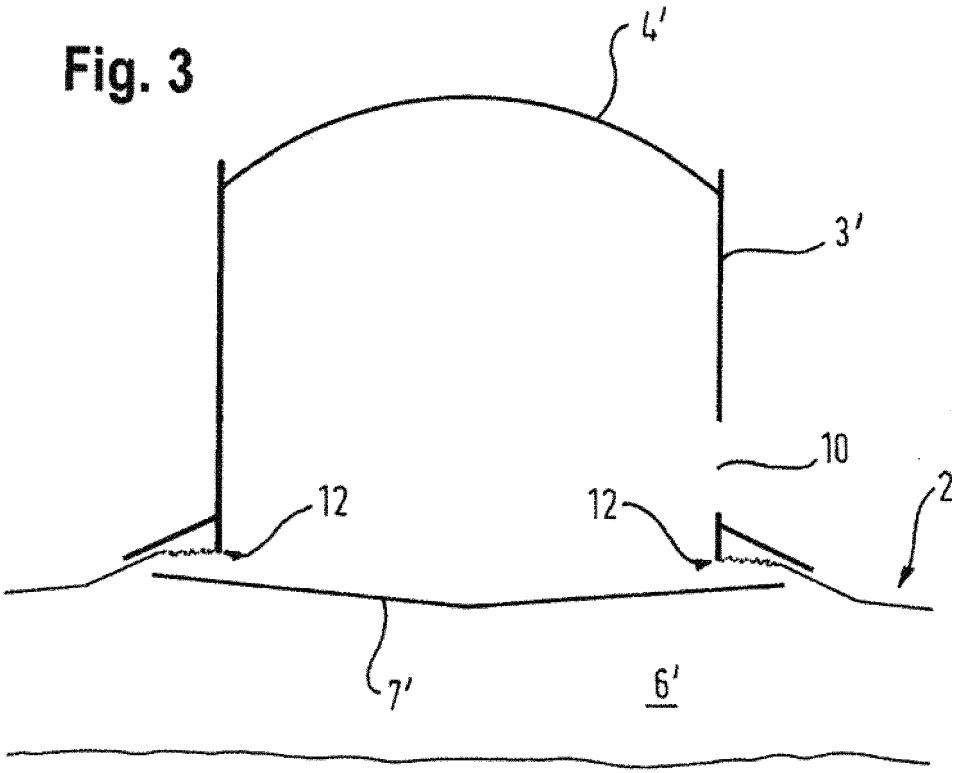

Fig. 4

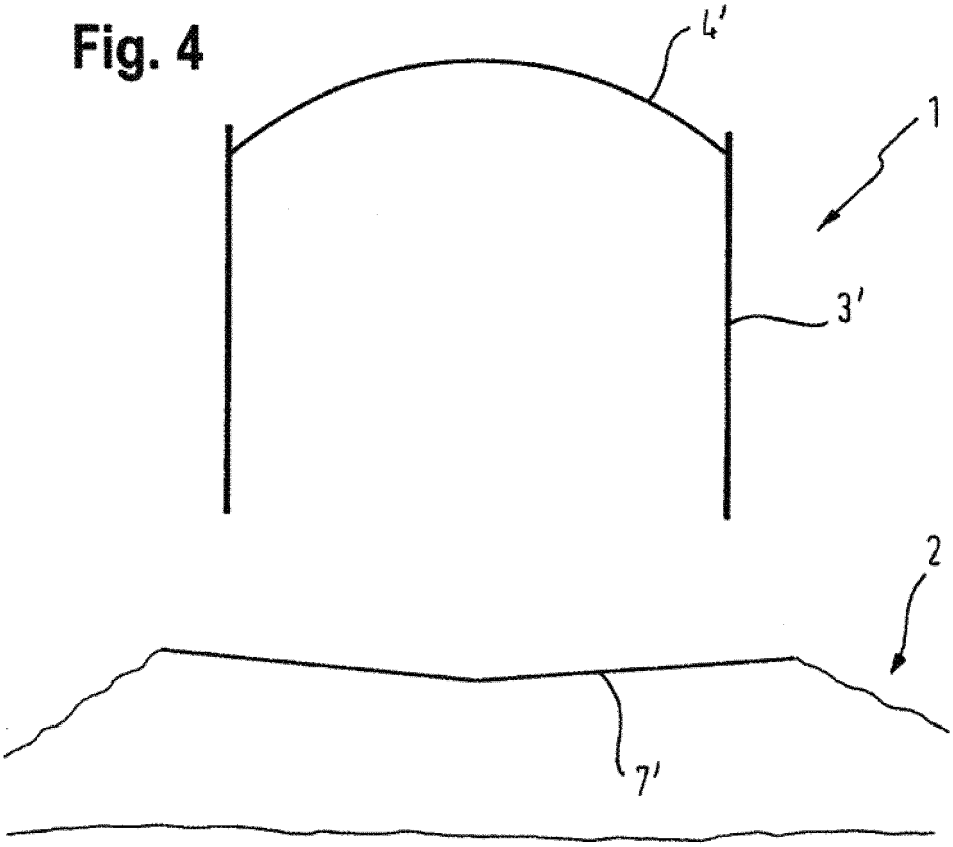

Fig. 5

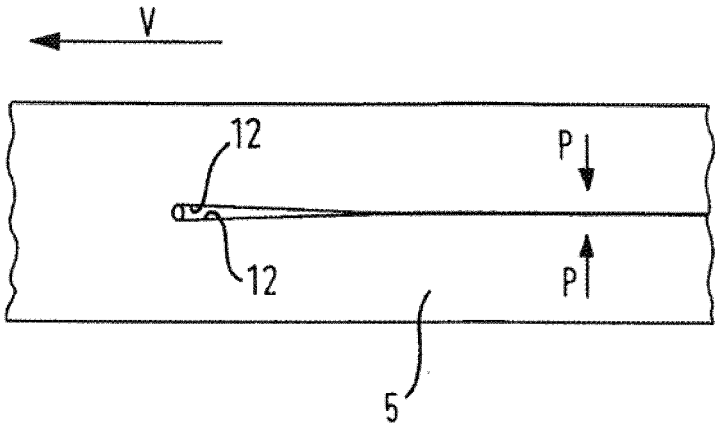

Fig. 6

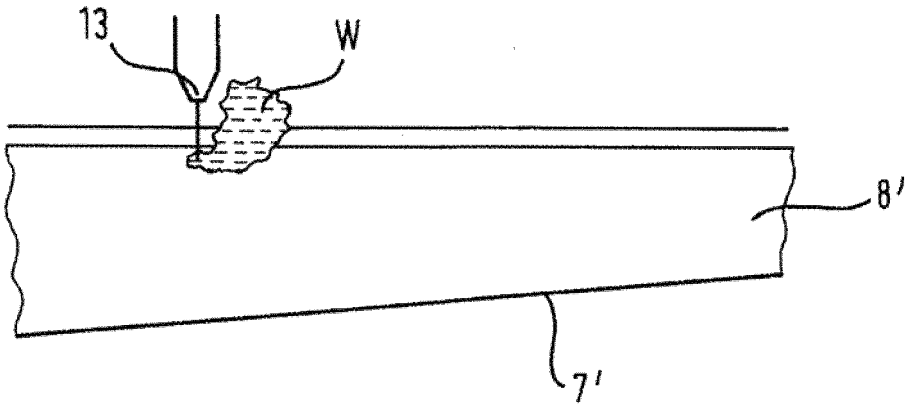

Fig. 7