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(54) Title of the Invention: Sewage shaft with cover, and adjustable settings for height and angle Abstract Title: A height and angle adjustable inspection chamber cover

(57) The inspection chamber has a concrete cone (4), at least 3 steel anchors (5) at the top, for screwing up the lifting eyes (6, figure 2) or threaded anchor bars (7). The space between the concrete cone (4) and the rounded cover (1) or the square cover (2) is filled with a ring (15) or ring parts (15). The rounded cover (1) is composed of a fixed part (1A), movable part (1B) and a cover plate (1C). The fixed part (1A) has at least 3 mounting holes (3, figure 6) and inside or outside there are in circumference at least 3 screw lines (11, figure 6) with the V-shaped projections (12V) or L-shaped projections (12L). The movable part (1B) has inside or outside in circumference at least 3 screw lines (11, figure 6) with the projections (12V) or (12L) placed mirror to the fixed part (1A). The square cover (2) is composed of a fixed part (2A), movable part (2B) and a cover plate (2C). The fixed part (2A) has four mounting holes (3, figure 6), inside or outside in circumference there are projections (13A) arranged staggered one behind the other. The movable part has inside or outside in circumference projections (13B) arranged staggered one behind the other, placed mirror to the fixed part (2A).

















FIGURE 5



















Sewage shaft with cover, and adjustable settings for height and angle

Field of technology

A technical solution concerning a principle for a new assembly method for the upper parts of sewage shafts and drainage hatches that allows the possibility of height and angle adjustments including the possibility for further adjustments during the operational life of the shaft without the necessity to break up the surface, therefore minimizing extensive traffic constraints and expenses.

Background of the invention

After thoroughly examining the installation of the sewage hatch covers and hatches, as well as the study of the appropriate technical manuals of hatchery and shaft production and installation procedures within the European Union, the following procedures and methods/processes for their construction and installation have been identified:

- A pre-fabricated base is laid at the bottom of the sewer in such a manner that the shaft is vertical not perpendicular to the previously modified and/or reinforced terrain
- Grooves for drain sewage are placed at the bottom of the sewer
- A drainage cone with a single groove is placed on the top of sewer cubes
- Grooves and cylindrical or wedge shaped drainage rings are placed on the drainage cone and covered with a cover plate if necessary
- A sewer hatch of either round or square shape is laid on top of the sewer rings

All these parts are glued/joined together with either one or a mixture of cement, glue or high strength foam adhesive. The holes are filled in with gravel and hatches are then fixed into position with cement or alternatively concrete.

This process is only functional in ideal conditions, which in practice means, that it's being installed as part of a new building site preferably in straight/flat/level terrain. Fundamental problems can arise during the installation process of the shaft if it is being installed on sloping/uneven terrain as the shaft is vertical and the terrain is inclined/tilted. Typically an angled wedge or rings are used to overcome this issue, however they rarely fit precisely, in addition they are brittle and often break either during installation or during the service life of the shaft. Further issues arise during the usage/operation of the shaft from the compression and pushing of the shaft into the ground by transportation traffic or when needs for new/higher road carpeting arise.

It is then necessary to pulverize/break up the surroundings of the shaft, loosen the asphalt, remove the hatch, cut out the foundation and clean everything. Sewer hatch is then aligned into position by rings but this is rarely perfect and rarely fits properly. This is followed by time consuming condensation of gravel layers and carpeting around the hatch area. On most occasions it is necessary to do this during full or partially limited traffic creating an unnecessary health and safety/security issue and costing a lot of money, not to mention the disruption to the normal flow of traffic. Hatches are currently being manufactured from materials such as cast iron, PVC, composite, concrete or combination of these materials. Shapes are either round or square. They are typically constructed from a frame and a cover plate or lattice. All hatches have smooth horizontal contact and mounting surfaces, which in reality is not true, because deformities occur during the manufacturing and cooling process, which result in parts being asymmetrical and not fitting properly into each other. Some manufacturers are addressing this issue with additional seals, but these accumulate dirt, gravel and road salts causing faster corrosion and wear.

Statement of invention

The purpose of this technical solution is to resolve:

a) design and assembly details, important during the stage of construction and completion of sewage shafts, to simplify their installation in difficult conditions on slopes,
b) design and assembly details important during the processes for its use, that is, during operation including to speed up and reduce repairs, mostly in connection with transport structures and construction.

Key solutions for the above sections:

a) which deals with the technical solution, is a different way of placing a concrete cone and the parts above it, by means of threaded anchor rods, serving in particular for supporting, positioning and anchoring a cast iron, plastic or composite hatch, in collaboration with nuts for adjusting the height inclination of the hatch, wherein the adjustment nuts are both at the top and bottom of the hatch and allow it to be fixed, either permanently or variably, depending on the shape of the adjustment nuts.

The space between the concrete cone and the cover is usually filled with a ring or parts thereof, which may be supplemented by concrete mix, wherein the threaded anchor bars will also at the same time provide a steel reinforcement for the structure above cone that would otherwise not exist, thereby making the joint more resilient and resistant to vibrations, especially from vehicle wheels.

b) this technical solution provides that during the operation of the sewage shaft and the hatch, i.e. when they are moved down by vibrations, repairs or new asphalt surfacing, it is not necessary to dig around the shaft's surroundings, loosen the asphalt, remove the hatch, cut the substrate and clean up everything, or subsequently to adjust the height of the hatch with rings, which will never ideally succeed, and then improvise by laying wedges under the hatch and then pouring concrete around the outside and finally using compaction and asphalt to bring the area to the required height

Advantages

The new hatch is designed to be mounted on a concrete cone in 2 basic shapes, such as round or square (polygonal). The differences between this new technical solution versus the various current hatches lies in the following technical solution:

Round hatch:

- The round hatch consists of a fixed and a movable part and a cover plate, the movable part being inserted inwards or slid externally into the fixed part. The fixed part has on its periphery, both inside and outside, a helix with projections, with at least 3 turns or least 3 pieces or more, with the movable part forming a counterpart, and having at its periphery, externally or internally also helical projections, mirroring in number and shape with relation to the fixed part.
- The helices have protrusions along their length, being either symmetrical in a V-shape or asymmetrical, shaped like Ls, that have a self-locking effect, thereby limiting the reciprocal movement between these two parts of the hatch and also their distorting one another during the impact of the wheels of vehicles.
- The height of the hatch is adjusted by lifting and rotating the movable part as when screwing the bolts but with the difference that the helical protrusions provide positional stability against spontaneous rotation in any direction. Depending on the number of protrusions through which the movable portion rotates, its height increases or decreases relative to the fixed part of the cover, by h1-hx.
- In the event of the extra clamping of the hatch, it is still possible to use a similar construction.
 - This technical solution in essentially excludes work related to maintenance and repairs, which is otherwise customary.

Square (polygonal) hatch:

- The square (polygonal) hatch consists of a fixed and movable part and a cover plate, the movable part being inserted inwards or slid externally into the fixed part. The fixed part has stepped protrusions at its periphery, both inside and outside, and the movable part forms a counterpart, also having at its periphery, both on the outside and on the inside, stepped protrusions in a number matching the fixed part.
- The stepped projections are designed to lift and turn the movable part on the square hatch up to 4 times by 90°, which means that it is possible to set 4 height positions, i.e. one height for each turn by 90°; for a polygonal hatch the number of height positions is dependent on the number of sides of the polygon.
- In the event of the extra clamping of the hatch, it is still possible to use a similar construction.
- This technical solution in essentially excludes work related to maintenance and repairs, which is otherwise customary.

Introduction to drawings

The nature of the technical solution will be explained by means of drawings

FIGURE 1 shows the present method of construction of a concrete sewage shaft with a cone, using compensating rings and a hatch, without the possibility of precise adjustment of height or angle, without steel anchors, threaded anchor bars, adjustment nuts or a movable adjustable part. In **FIGURE 2** there is a concrete cone having at least 3 steel anchors on its upper and narrowest part, used for screwing on lifting eyes, for lifting and lowering the cone onto the shaft.

In **FIGURE 3** there are threaded anchor rods screwed into the concrete cone, and adjustment of the height and inclination of the hatch is carried out by means of the adjustment nuts and where the intermediate space is filled with the concrete ring with holes or parts of a ring.

In **FIGURE 4** there are details of steel anchor bolts for screwing on hoisting eyes, also for lifting and locating the cone on the shaft as well as the detail of the bolted threaded anchor rod, for adjustment of the height and inclination of the hatch, by means of adjustment nuts and washers. In **FIGURE 5** there are the details of the adjustment nuts, both at the bottom and the top of the cover, allowing adjustment and fixation of its height and fixation, which may be permanent by using conventional washers and nuts, or variable, due to the different shape of the lower adjustment nuts which are controlled from above, and from below they have a conical shape to prevent adhesion to the concrete.

In **FIGURE 6** are views and cross sections of a round hatch consisting of fixed and movable parts and the cover plate, and which has at its periphery both inside and outside at least 3 or more helices with projections. The helices with projections are V-symmetrical or asymmetrical with an L-shape. The height of the hatch is adjusted by lifting and rotating the movable part against the fixed part, by h1 - hx.

In **FIGURE 7** there are cross sections of a round hatch, **showing the** alternatives of V-shaped or L-shaped projections, wherein the movable part is inserted inwards or slid externally into the fixed part, with the possibility of extension by means of a spacer.

In **FIGURE 8** there are views and cross-sections of a square hatch consisting of a fixed and movable part and a cover plate, where the movable part is inserted inwards or slid externally into the fixed part, and it has stepped projections along its periphery, both inside and outside.

In **FIGURE 9** there are views and a cross-section of the square hatch, where the movable part is inserted into the fixed part, with stepped projections where by turning 4 times at 90 ° there are 4 height positions, h1 to h4.

In **FIGURE 10** there are views and a cross-section of the square hatch, where the movable part is slid onto the fixed part with the stepped projections, where by turning 4 times at 90 ° there are 4 height positions, h1 to h4.

In **FIGURE 11** there are views and a cross-section of a square hatch where the movable part extends into a fixed part with stepped projections, and to achieve better stability of the movable part it is possible to multiply the number of stepped projections by several times.

Examples of embodiments

The circular hatch $\underline{1}$, consists of the fixed part $\underline{1A}$, the movable part $\underline{1B}$, and the cover plate $\underline{1C}$, the fixed part $\underline{1A}$ having at least 3 mounting holes $\underline{3}$.

The rectangular hatch (2) consists of the fixed part <u>2A</u>, the movable part <u>2B</u>, and the cover plate **2C**, the fixed part **2A** having 4 mounting holes **3**.

The hatch is located on a drainage shaft having a concrete cone $\underline{4}$ with at least 3 built-in steel anchors $\underline{5}$ on its upper and narrowed part which are incorporated into the structure during casting.

Steel anchors <u>5</u> serve to attach the lifting eyes <u>6</u>, for lifting and location of the cone

onto the sewage shaft. The Steel anchors $\underline{\mathbf{5}}$ serve also to hold the screwed threaded anchor rods $\underline{\mathbf{7}}$, for adjustment of the height and inclination of the round hatch $\underline{\mathbf{1}}$ or the square hatch $\underline{\mathbf{2}}$, and using

adjustment nuts **8**, washers **10**, both from the bottom and top of the hatch **1** or **2 it is possible to**

<u>adjust the</u> height or inclination, which may be permanent, Or in the case of the conically shaped lower adjustment nuts $\underline{9}$ it may also be variable, controllable from the top so that by turning them at any time it is possible to raise hatch $\underline{1}$, or $\underline{2}$

The space between the concrete cone $\underline{4}$ and the hatch 1 or $\underline{2}$ vertically and also horizontally for the threaded anchor rods **7**, is filled with ring **15**, or parts of the ring **15**.

The round hatch $\underline{1}$ at its fixed part $\underline{1A}$, has on its periphery both inside and outside, a helix $\underline{11}$, at least 3 in number, these having symmetrical projections along their length $\underline{12V}$ in a V-shape, or asymmetrical projections $\underline{12L}$, in an L-shape.

The height of the round hatch h1 - hx is adjusted by lifting and rotating the movable portion <u>1B</u> of the hatch <u>1</u>, which is also has on its periphery externally or internally the helix 12V or 12L, mirroring the fixed section <u>1A</u>.

The square (polygonal) hatch $\underline{2}$ has 4 mounting holes $\underline{3}$ on the fixed part $\underline{2A}$, and along its periphery on the fixed part, on the inside or on the outside, has stepped projections $\underline{13A}$ and on the movable part $\underline{2B}$, either on the outside or on the inside, also has stepped protrusions $\underline{13B}$ such that by rotating the movable part $\underline{2B}$ relative to the fixed part $\underline{2A}$, namely 4 times by 90 °, it is possible to set the 4 height positions h1 to h4 as such, while in the case of a polygonal hatch it is dependent of the number of sides for height h1-hn. For greater stability the stepped projections $\underline{13A}$ and $\underline{13B}$ may be multiplied several times.

Annotated description

The sewage shaft consists of a concrete cone (4), with at least 3 steel anchor bolts (5) at the top, for screwing on lifting eyes (6) or threaded anchor bars (7).

The space between the concrete cone (4) and the circular hatch (1) or square

The hatch (2), is filled with a ring (15), or part of a ring (15).

The round hatch (1) is composed of a fixed part (1A), a movable part (1B) and a cover plate (1C). The fixed part (1A) has at least 3 mounting holes (3) [Translator – not easily visible on drawings], and inside or outside the periphery, at least 3 helices (11) with V-shaped projections (12V), or L shaped projections (12L).

The movable part (1B) has inside or outside periphery at least 3 helices (11) with projections (12V) or (12L), arranged to mirror the fixed part (1A).

The square hatch (2) is composed of a fixed part (2A) a movable part (2B) and a cover plate (2C). The fixed part (2A) has 4 mounting holes (3), and inside or outside the periphery Projections (13A) arranged in stepped formation.

The movable part (2 B) has inside or outside the periphery projections (13B), arranged in stepped formation, to mirror the fixed part (2A).

<u>Claims</u>

1. A sewage shaft with cover, and adjustable settings for height and angle, *characterized thereby* that it consists of a concrete cone (4) with at least 3 steel anchor bolts (5) at the top, for screwing on lifting eyes (6) or threaded anchor bars (7).on which is fitted a hatch (1, 2) which comprises a fixed part (1 A, 2 A) with mounting holes (3), a movable part (1B, 2B) disposed on the fixed part (1A, 2A) and a cover plate (1C, 2C) mounted on the movable part (1B, 2B), the fixed part (1A, 2A) and movable part (1B, 2B) being provided with projections inside or outside the periphery (12V,12L,13A, 13B).

2. A sewage shaft with cover, and adjustable settings for height and angle as in claim 1, *characterized thereby* that the threaded anchor bars (7) are provided with adjustment nuts (8) or the lower adjustment nuts (9) with washers (10), the space between the concrete cone (4) and the hatch (1,2) being filled by a ring (15).

3. A sewage shaft with cover, and adjustable settings for height and angle as in claim 1, *characterized thereby* that the round cover (1) has inside or outside the periphery of the fixed part (1A) at least 3 helices (11) with projections (12V,12L) arranged to mirror the movable part (1B), which has at least 3 helices (11) with projections (12V, 12L).

4 A sewage shaft with cover, and adjustable settings for height and angle as in claim 1, *characterized thereby* that the square cover (2) has inside or outside the periphery of the fixed part (2A) stepped projections (13A) arranged to mirror the movable part (2B) with stepped projections (13B).

Intellectual Property Office

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Claims searched:	1-4	Date of search:	16 October 2019

Patents Act 1977: Search Report under Section 17

Documen	vocuments considered to be relevant:				
Category	Relevant to claims	Identity of document and passage or figure of particular relevance			
Х	1-4	EP 0010062 A1 (HASHEER) See abstract and figures 1 and 4-7 in particular.			
Х	1-4	CN 208668467 U (LIN) See abstract and figure 2 in particular.			
Х	1-4	GB 2175334 A (WRIGHT) See description, claims and figure 1 in particular.			
Х	1-4	GB 1434241 A (LARSSON) See abstract and figures 1, 4 and 5 in particular.			
Х	1-4	CN 107780439 A (SHANXI) See abstract and figure 1 in particular.			

Documents considered to be relevant:

Categories:

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Х	Document indicating lack of novelty or inventive	А	Document indicating technological background and/or state
	step		of the art.
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&	Member of the same patent family	Е	Patent document published on or after, but with priority date
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Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^X :

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 E02D

 The following online and other databases have been used in the preparation of this search report

 WPI, EPODOC

International Classification:

Subclass	Subgroup	Valid From
E02D	0029/14	01/01/2006

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