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(54) **ANCHOR & METHOD**

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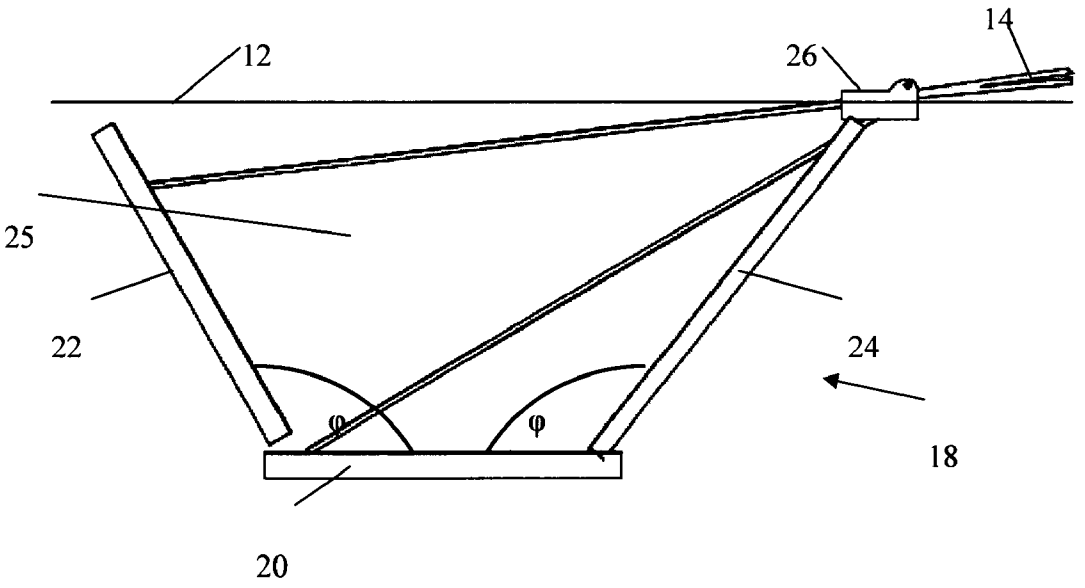
(57) **ABSTRACT**

Anchor (**18**) for tensioning at least one component for a civil engineering construction (**14**), which anchor (**18**) is arranged to at least partly be located in the ground/underlying surface (**12**). The anchor (**18**) comprises at least one surface (**20**, **22**, **24**) that is intended to at least partly be covered with material (**25**), so that only the weight of said material (**25**) which acts on said at least one surface (**20**, **22**, **24**) gives said anchor (**18**) the capacity for tensioning said at least one component for a civil engineering construction (**14**).



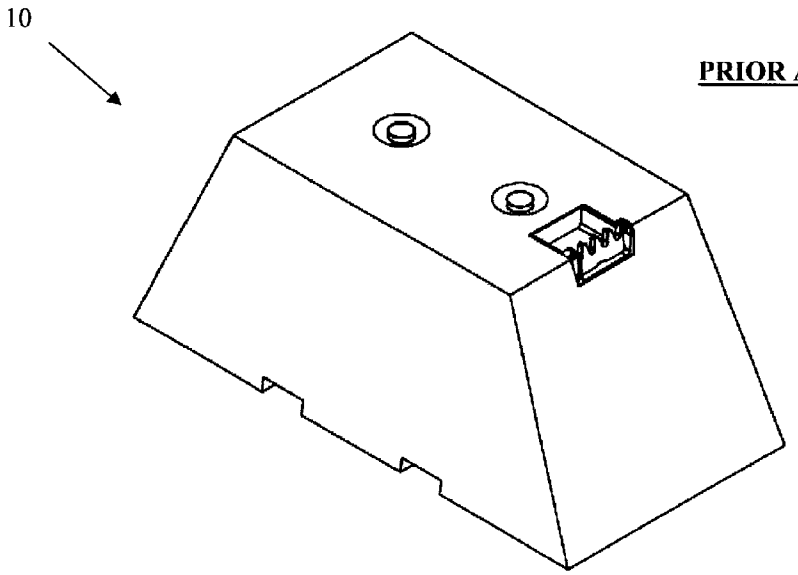


Fig. 1

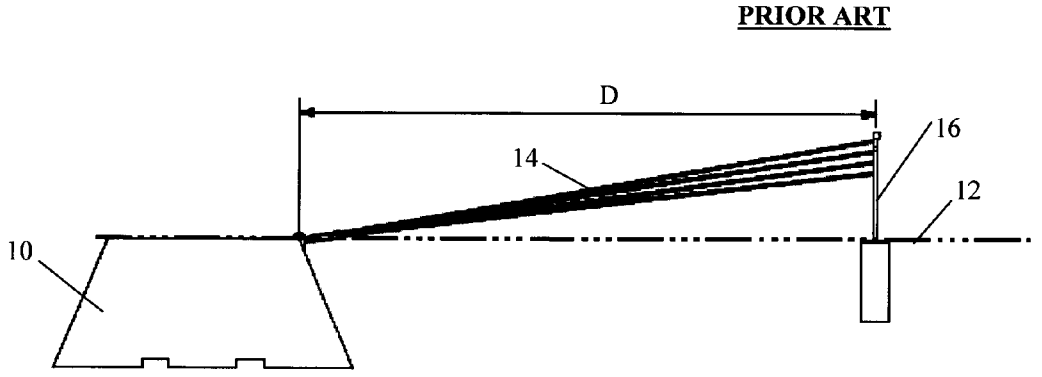


Fig. 2

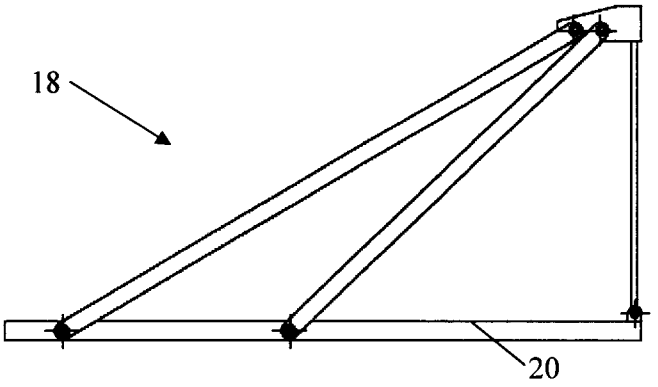


Fig. 3

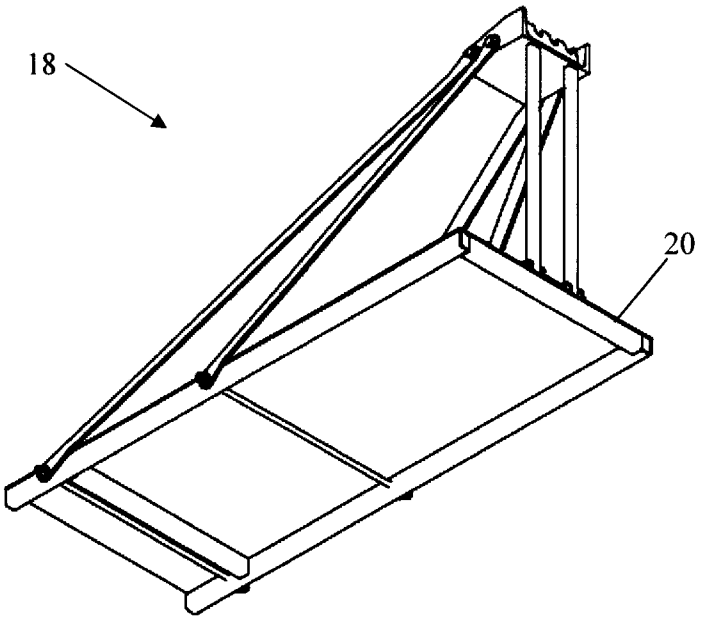


Fig. 4

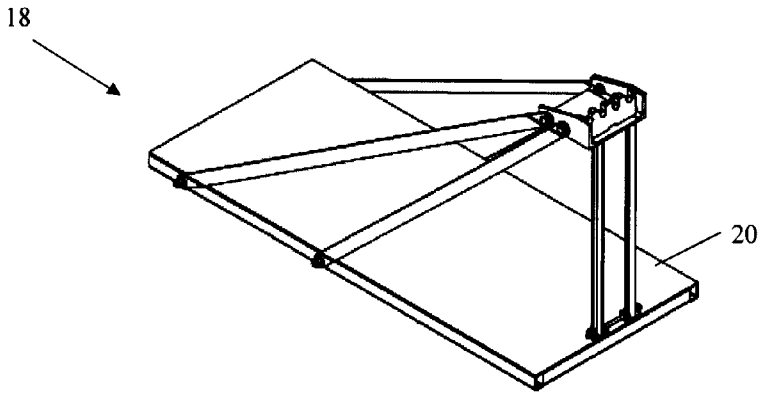


Fig. 5

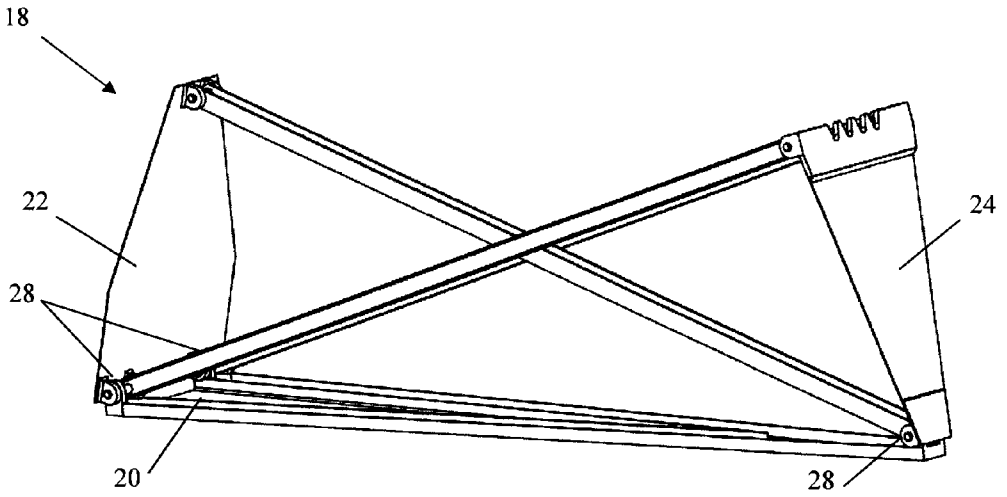


Fig. 6

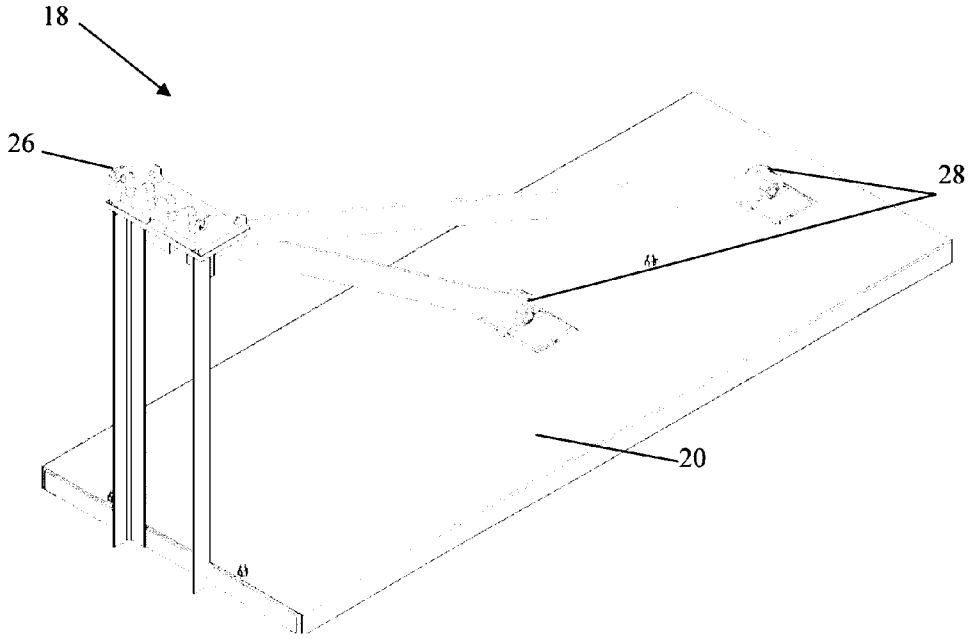


Fig. 7

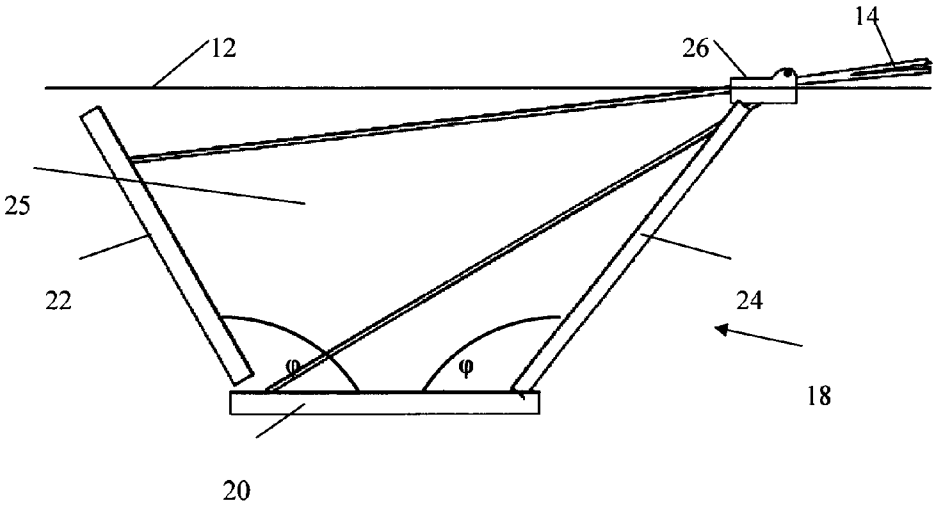


Fig. 8

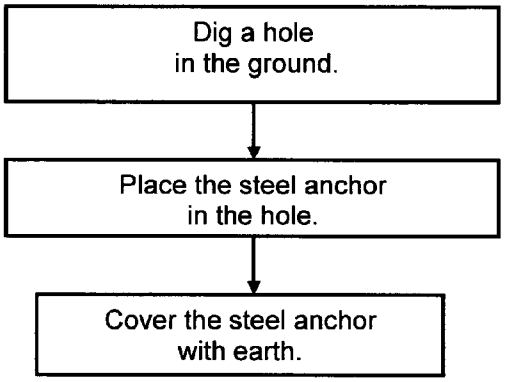

Dig a hole
in the ground.
Place the steel anchor
in the hole.
Cover the steel anchor
with earth.

Fig. 9

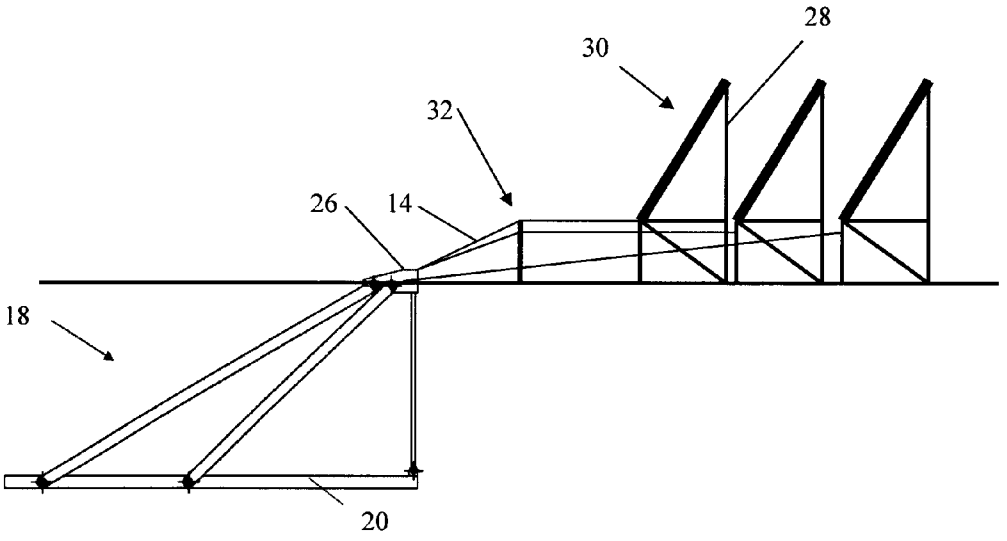

28
30
32
26
14
18
20

Fig. 10

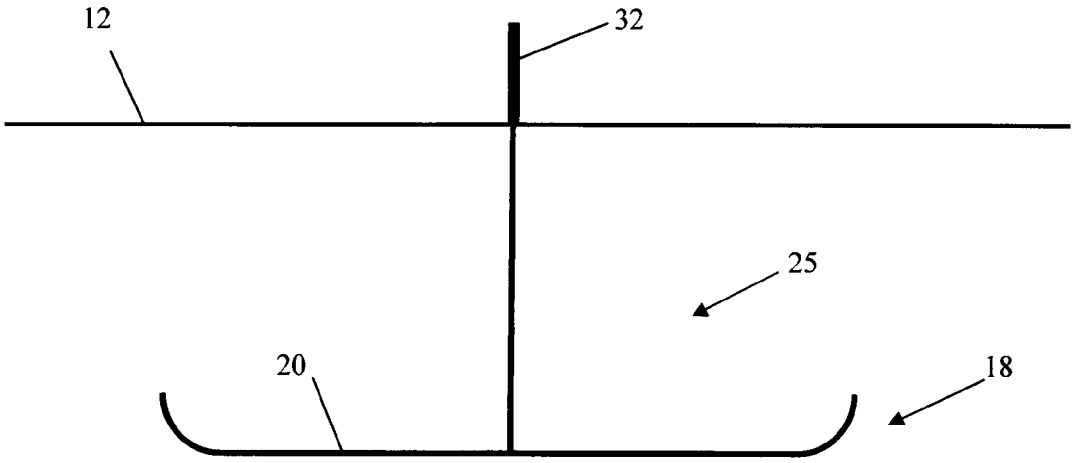


Fig. 11

ANCHOR & METHOD

TECHNICAL FIELD

[0001] The present invention concerns an anchor for tensioning at least one component for a civil engineering construction. The present invention also concerns a method for securing an anchor for tensioning at least one component for a civil engineering construction, at least partly in the ground/underlying surface.

BACKGROUND OF THE INVENTION

[0002] In many civil engineering constructions cables are fed down to an anchor in the ground, which anchor is used to tension the cables. Anchors are for example used in a road safety fence. A road safety fence is a continuous obstruction along a road, which is mounted with the aim of increasing traffic safety by preventing vehicles from driving into the lane of a vehicle travelling in the opposite direction and to prevent a vehicle from leaving the roadway in the case of an accident, especially in places where there is a particular risk for consequent injury, such as by water or in places with large height level differences.

[0003] The road safety fences that are used on most European roads are tested according to a standard EN1317. This standard requires crash tests to be carried out by an accredited crash test laboratory. There are different capacity levels depending on which type of safety equipment a section of road requires. In Sweden for example, road safety fences usually meet class N2 requirements, which means a crash test with a vehicle that weighs 1500 kg at 110 km/h and with a 20° approach angle, while bridge railings are often tested in class H2, which means a crash test with a bus weighing 13 tons at 70 km/h and a 20° angle.

[0004] A steel wire fence often comprises a plurality of posts secured substantially vertically in the ground or another underlying surface at a distance from one another, and at least one substantially horizontal steel wire fixed to the posts. A concrete anchor, which usually weights three to four tons, and which has a volume of almost two cubic metres is placed at the start and the end of the road safety fence. Such a concrete anchor can be pre-fabricated or it can be cast on site. A hole is dug in the ground and the concrete anchor is placed in the hole. One or more steel wires are fastened to the anchor and are brought to the right tension.

[0005] A disadvantage with pre-fabricated anchors is that they are difficult to transport and move. A disadvantage with anchors that are cast on site is that the anchor material and the equipment that is needed to cast an anchor on site must be transported to the installation site.

SUMMARY OF THE INVENTION

[0006] An object of the present invention is to provide an improved anchor for tensioning, i.e. for maintaining an applied tension in, or applying a tension to at least one component for a civil engineering construction.

[0007] This object is achieved by an anchor that is arranged to at least partly be located in the ground/underlying surface. The anchor comprises at least one surface that is intended to be at least partly covered with material so that the weight of this material which acts on said at least one surface gives the anchor the capacity for tensioning said at least one component for a civil engineering construction, such as a cable, a lead, a wire or a line that is directly or indirectly fastened to a component, or that is integrated with a component.

[0008] Instead of using a heavy anchor made of concrete for example, a much lighter anchor can be manufactured from metal, a composite material, plastic or some other suitable material. It is the weight of the material that is laid above and/or around the anchor and the resistance in the ground/underlying surface that surrounds the anchor, which weight acts on said at least one surface, which gives the anchor the capacity for tensioning said at least one component for a civil engineering construction. Such an anchor is simpler to manufacture, handle, transport and move.

[0009] The expression "anchor for tensioning at least one component for a civil engineering construction" means that the anchor must be suitable for tensioning a component for a civil engineering construction with a tension of at least 5 kN, at least 10 kN, at least 20 kN, at least 30 kN or higher when the anchor is in use. 1-10 tons of material, or more, can for example be needed to obtain the desired tension depending on the application. At least one element, such as a steel wire or the like, which element is used to connect the anchor to at least one component for a civil engineering construction is arranged at or above ground- or water level, i.e. it is not buried in the ground or located under water and it does not extend at least partly below ground level or water level. The at least one element extends along ground level or water level and/or above ground level or water level, and is directly or indirectly fastened to the anchor.

[0010] The expression "at least one surface" does not only mean a substantially two-dimensional part of the anchor, such as a plate. It can also be at least one surface of a three-dimensional part of the anchor, such as a beam. Said at least one surface does not necessarily have a continuous surface but can contain holes, cavities, raised portions, channels or other features. Said at least one surface can for example be a grid or an angled plate. Said at least one surface does not necessarily need to be flat, and can have any shape, cross section and/or thickness. Said at least one surface has for example a surface area that can be covered with material of at least 0.5 m^2, at least 1 m^2, at least 2 m^2, at least 3 m^2, at least 4 m^2, at least 5 m^2 or larger. An anchor according to the present invention can occupy a volume of 1-10 m^3 or more.

[0011] The word "material" as used in the expression "at least one surface is covered with material" means material that is not the same as the material from which the anchor itself is manufactured. It can be material from the surrounding ground and/or the surrounding underlying surface in which the anchor is at least partly located, such as earth and/or other material that is moved/dug out in order to at least partly secure the anchor in the ground/underlying surface. Additionally, or alternatively this material can be earth, water, rocks and/or other material that is transported to the installation site.

[0012] According to an embodiment of the invention said at least one surface of at least one plate consists of a plate, a grid, a beam or some other component, and comprises metal, plastic- or a composite material.

[0013] An anchor according to the present invention can comprise a frame-like structure that is placed in the ground or in the underlying surface. According to another embodiment of the invention the anchor comprises a plurality of components, such as plates and/or beams provided with hinges. Such an anchor can be transported to the installation site in a folded state and be unfolded on installation to facilitate its transportation and handling. Additionally, or alternatively an anchor

can comprise a plurality of joined components, such as plates and/or beams. Such an anchor can be at least partly constructed at the installation site, for example by joining the components with a weld or bolt joint. The anchor can comprise a first plate that is intended to be located substantially horizontally when said anchor is in use and a second component that is arranged so that it forms an angle of 91-180°, for example 120-160° to said first steel plate when said anchor is in use.

[0014] The present invention also concerns a civil engineering construction, such as a road safety fence, a railway, a bridge, a tunnel, a harbour, a pier, a ferry berth, a canal, a lock, a monument, a beacon, an airport, a park, a fence, a fortification, a building, a portal, a lamppost, a flag pole, a renewable energy construction, such as a solar panel park, a floating or non-floating platform such as a wind energy installation or some other installation, which civil engineering construction comprises at least one component for a civil engineering construction that is tensioned using at least one anchor according to an embodiment of the invention.

[0015] The present invention further concerns a method for securing an anchor for tensioning at least one component for a civil engineering construction, at least partly in the ground/underlying surface. The method comprises the step of securing at least one surface of the anchor in the ground and at least partly covering said at least one surface with material so that the weight of this material that acts on said at least one surface gives the anchor the capacity for tensioning said at least one component for a civil engineering construction. Further embodiments of the method are recited in the dependent claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] In the following, the present invention will be described in more detail with reference to the accompanying schematic figures in which:

[0017] FIGS. **1** & **2** show an anchor according to the prior art

[0018] FIGS. **3-8**, **10** & **11** show an anchor according to embodiments of the present invention, and

[0019] FIG. **9** shows a method according to an embodiment of the present invention.

[0020] It should be noted that the drawings have not necessarily been drawn to scale and that the dimensions of certain features may have been exaggerated for the sake of clarity.

[0021] It should also be noted that a feature that is described in connection with one embodiment of the invention can be applied to any other embodiment of the invention unless the description explicitly excludes this possibility.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0022] FIG. **1** shows a concrete anchor **10** according to the prior art, which concrete anchor **10** weights about 3 to 4 tons. FIG. **2** shows a concrete anchor **10** that has been buried below ground level **12** in order to tension a plurality of steel wires **14** of a road safety fence that comprises a plurality of posts **16** intended to be secured substantially vertically in the ground **12** at a distance from one another. The steel wires **14** are fastened to the posts **16** and to the concrete anchor **10** and are brought to the right tension. The anchor **10** is placed at a distance D, of for example 1-20 m, or 3-12 m from the start and end of the road safety fence.

[0023] FIGS. **3-8** and **10** show an anchor **18** according to an embodiment of the present invention for tensioning at least one component for a civil engineering construction **14** according to an embodiment of the invention. The anchor **18** is arranged to be located in the ground/underlying surface and comprises a surface **20** that is intended to at least partly be covered with material, so that the weight of said material which acts on said surface **20** gives the anchor the capacity for tensioning at least one component for a civil engineering construction.

[0024] FIG. **8** shows an anchor **18** according to an embodiment of the present invention, which anchor comprises surfaces **20**, **22**, **24** intended to be covered with material **25** so that the weight of said material **25** which acts on the surfaces **20**, **22**, **24** gives the anchor **18** the capacity for tensioning at least one component for a civil engineering construction, for example a steel wire **14** of a road safety fence. A road safety fence can have one to six steel wires **14**. The uppermost steel wire can for example be placed at a height of 600-800 mm. One or more steel wires **14** can for example be fastened to the anchor **18** using an anchor-embedded component **26**. An anchor-embedded component **26** does not however necessarily need to be located at ground level **12** as shown in the illustrated embodiment.

[0025] The road safety fence can be a side, centre or slope railing. A side railing is placed at the side of a roadway (on the hard shoulder), a centre railing is placed between traffic travelling in opposite directions in the central part of a road, either in the road base or in tarmac, or when the distance between traffic travelling in opposite directions is small, such as when a 13 m road is converted to a 2+1 road, and a slope railing is placed on a slope at the side of the road. The slope railing is high enough to handle a car that flies out over the slope and low enough to take care of a car that follows the slope's inclination. The advantages with placing a railing on a slope at the side of the road are to provide more space for pedestrians and cyclists or for cars that have broken down, to provide more space for snow (i.e. when the snow melts the risk of melting snow and water flowing onto the roadway is decreased), and to provide simpler snow clearance of the roadway edge and the side of the roadway.

[0026] Even though the illustrated embodiment shows a road safety fence, an anchor **18** according the present invention can be used to tension any component(s) for civil engineering construction. A single anchor **18** can be used to tension a plurality of components for civil engineering constructions, or a plurality of anchors **18** can be used to tension a single component for a civil engineering construction or a smaller number of components for civil engineering constructions.

[0027] Said at least one component for a civil engineering construction is for example at least one component for one of the following: a road, such as a road safety fence, a railway, a bridge, a tunnel, a harbour, a pier, a ferry berth, a canal, a lock, a monument, a beacon, an airport, a park, a fence, a fortification, a building, a portal, a lamppost, a flag pole, a renewable energy construction, such as a solar panel park, a floating or non-floating platform such as a wind energy installation.

[0028] It should be noted that an anchor **18** according to the present invention does not necessarily need to tension at least one component for a civil engineering construction that is located above the ground **12**. It can also be used for tensioning

at least one component for a civil engineering construction that is at least partly located below the ground/underlying surface.

[0029] It should also be noted that even a concrete anchor **10** according to the prior art such as that shown in FIG. **1** can comprise inclined sides that are covered with material when the anchor **10** is in use. The weight of the material that covers these inclined surfaces is however negligible compared with the weight of the concrete anchor **10**. An anchor **18** according to the present invention is arranged so that the weight of material that covers said at least one surface **20**, **22**, **24** when the anchor **18** is in use is at least ten times, or at least 20 times, or at least 50 times, or at least 100 times heavier or more, than the weight of the anchor **18** itself.

[0030] In the illustrated embodiment the surfaces **20**, **22**, **24** consist of metal plates, such as steel plates, provided with hinges **28**. The surfaces **20**, **22**, **24** can be substantially rectangular or triangular and/or they can be at least partly covered with a coating, such as a rust-preventing coating. The steel anchor **18** can be transported to the installation site in a folded state, and be unfolded on installation of the anchor **18** in the ground. A first plate **20** is arranged to be located substantially horizontally when the anchor **18** is in use and the other two plates **22**, **24** are arranged so that they form an angle cp of **120°** to the first plate **20** when the anchor **18** is in use. An anchor **18** according to the present invention can also comprise retaining element or tension elements, such as cables or beams, in order to hold the anchor's surfaces **20**, **22**, **24** in place while they are at least partly covered with material **25**.

[0031] The first plate **20** can be located 0.7-2 m below ground level **12** when the anchor is in use. The first plate **20** can for example have a length of 1-4 m and/or a width of 0.7-2 m and/or a total surface area of 2-8 m^2 that can be covered with material **25**. An anchor **18** according to the present invention can however be dimensioned in any way depending on the application and the tension that must be achieved.

[0032] FIG. **9** shows a method for securing an anchor **18** for tensioning at least one component for a civil engineering construction, at least partly in the ground/underlying surface. The method comprises the step of securing at least one surface **20**, **22**, **24** of the anchor **18** in the ground/underlying surface in some suitable manner, for example by digging a hole in the ground **12** and placing the anchor **18** in the hole. Said at least one surface **20**, **22**, **24** is at least partly covered with material **25**, such as surrounding earth and stones so that the weight of said material **25** which acts on the at least one surface **20**, **22**, **24** gives the anchor the capacity for tensioning at least one component for a civil engineering construction.

[0033] FIG. **10** shows an anchor **18** according to an embodiment of the present invention, which anchor **18** comprises a surface **20** intended to be covered with material **25** so that the weight of said material **25** which acts on the surface **20** gives the anchor **18** the capacity for tensioning at least one component for a civil engineering construction, such as a steel wire **14** in a construction **28** on which at least one solar panel or solar collector **30** is mounted. A solar panel park can for example comprise a plurality of solar panel-supporting constructions **30**, whereby each construction **30** comprises a metal frame, such as an aluminium frame, on which at least one solar panel **30** is mounted. Instead of tensioning each construction **30** with a cable and a post provided with a thread which is screwed into the ground, such as in existing solutions, an anchor **18** according to the present invention can be used for tensioning a plurality of constructions **30**, whereby one or more steel wires **14** that is/are connected to one or more constructions **30** for example, can be fastened directly to the anchor **18** using an anchor-embedded component **26**, and/or indirectly to the anchor **18** via one or more posts **32**.

[0034] FIG. **11** shows an anchor **18** according to an embodiment of the present invention, which anchor **18** comprises a surface **20** intended to be covered with material **25** so that the weight of said material **25** which acts on the surface **20** gives the anchor **18** the capacity for tensioning at least one component for a civil engineering construction. One or more steel wires in a construction on which at least one solar panel or solar collector is mounted can for example be fastened to a post **32**, which in the illustrated embodiment constitutes part of the anchor **18**. The anchor **18** can then absorb forces wanting to lift and/or displace the post **32** in wind, or if a civil engineering construction is subjected to some other force.

[0035] It should be noted that features that have been described in connection with one or a number of embodiments can also be included in other embodiments of the present invention.

[0036] Several modifications of the invention are possible within the scope of the accompanying claims.

1. Anchor for tensioning at least one component for a civil engineering construction, which anchor is arranged to at least partly be located in the ground/underlying surface, whereby said at least one component for a civil engineering construction comprises at least one element that is used to connect said at least one component for a civil engineering construction to said anchor, said anchor comprises at least one surface that is intended to at least partly be covered with material, so that the weight of said material which acts on said at least one surface gives said anchor the capacity for tensioning said at least one component for a civil engineering construction, and whereby said at least one element is arranged at or above ground- or water level, i.e. said at least one element is not buried in the ground or located under water and it does not extend at least partly below ground level or water level.

2. Anchor according to claim **1**, wherein said at least one surface is constituted by at least one plate, a grid or a beam.

3. Anchor according to claim **1**, wherein it comprises a plurality of joined components.

4. Anchor according to claim **1**, wherein it comprises a plurality of components, such as plates and/or beams provided with hinges.

5. Anchor according to claim **4**, wherein it comprises a first plate that is intended to be located substantially horizontally when said anchor is in use, and a second plate that is arranged so that it forms an angle of 91-180° to said first plate when said anchor is in use.

6. Anchor according to claim **1**, wherein said at least one surface has a surface area of at least 0.5 m^2.

7. Civil engineering construction that comprises at least one component for a civil engineering construction which is tensioned using at least one anchor, wherein it comprises at least one anchor according to claim **1**.

8. Civil engineering construction according to claim **7**, wherein it comprises one of the following: a wall, a road safety fence, a railway, a bridge, a tunnel, a harbour, a pier, a ferry berth, a canal, a lock, a monument, a beacon, an airport, a park, a fence, a fortification, a building, a portal, a lamppost, a flag pole, a renewable energy construction, a floating or non-floating platform.

9. Method for securing at least one anchor with at least one surface for tensioning at least one component for a civil

engineering construction, at least partly in the ground/underlying surface, wherein said method comprises the step of securing said at least one surface of the at least one anchor in the ground/underlying surface, and at least partly covering said at least one surface with material so that the weight of said material which acts on said at least one surface gives said at least one anchor the capacity for tensioning said at least one component for a civil engineering construction, and arranging at least one element of said at least one component for a civil engineering construction to connect said at least one component for a civil engineering construction to said anchor at or above ground- or water level, i.e. whereby said at least one element is not buried in the ground or located under water and it does not extend at least partly below ground level or water level.

10. Method according to claim **9**, wherein said at least one surface comprises at least one plate, a grid or a beam.

11. Method according to claim **9**, wherein said anchor comprises a plurality of joined components.

12. Method according to claim **9**, wherein said anchor comprises a plurality of components provided with hinges.

13. Method according to claim **12**, wherein said method comprises the step of laying a first plate substantially horizontally in the ground/underlying surface and positioning a second plate to form an angle of 91-180° to said first plate.

14. Method according to claim **9**, wherein said at least one surface has a surface area of at least 0.5 m^2.

15. Method according to claim **9**, wherein said at least one component for a civil engineering construction is at least one component for at least one of the following a wall, a road safety fence, a railway, a bridge, a tunnel, a harbour, a pier, a ferry berth, a canal, a lock, a monument, a beacon, an airport, a park, a fence, a fortification, a building, a portal, a lamppost, a flag pole, a renewable energy construction, a floating or non-floating platform.

* * * * *