Method for providing concrete foundation piles and hollow earth drill to be used for that purpose.

The invention relates to a method for providing concrete foundation piles in the ground, whereby a tube (1) provided with a helical blade (3) on its periphery is screwed into the ground to the desired depth, after which, while the tube (1) is being withdrawn, concrete is introduced in the hole formed by means of the tube (1) through the interior of the tube (1), via a discharge opening (5) located near the bottom side of said tube (1). Use is made of a tube (1) having a constant diameter along at least substantially its entire length, whose bottom end, along which the end of the helical blade (3) extends, is conical. When the tube (1) is being withdrawn from the ground concrete is supplied under pressure and pressed out of the tube (1) via the discharge opening (5), a closing means (6) of said discharge opening (5) being opened under the influence of the pressure exerted by the concrete.
Method for providing concrete foundation piles and hollow earth drill to be used for that purpose.

The invention relates to a method for providing concrete foundation piles in the ground, whereby a tube provided with a helical blade on its periphery is screwed into the ground to the desired depth, after which, while the tube is being withdrawn, concrete is introduced in the hole formed by means of the tube through the interior of the tube, via a discharge opening located near the bottom side of said tube.

Such a method can be derived from the European patent 0010037. This method makes use of a tube whose bottom end has a larger diameter than the remaining part of the tube. In said part having a larger diameter there is provided a hydraulically operated adjusting mechanism for opening and closing a valve closing the bottom side of the tube.

A first disadvantage is constituted by the fact that the shape of the bottom end of the tube is less suitable for promoting the penetration of the tube into the ground. Besides that it will be possible for the earth moved sideways by the bottom end of the tube to move back into the hole formed by the bottom end of the tube, as a result of which no effective compaction of the earth is achieved, and possible narrowings may be formed in the freshly formed pile shaft.

Besides that the earth drill is vulnerable, in particular in connection with the adjusting mechanism for the valve closing the tube at the bottom side and the hydraulic lines required for that purpose, and in view of the rough operation to which such an earth drill is exposed.

A similar method can be derived from FR-A-438,488. From US-A-3,875,751 a method can be derived whereby a column of earth is loosened by means of a short helical blade secured on the end of a thin shaft, after which concrete is injected into the hole. Also in this case no essential compaction of the earth around the foundation pile will be effected.

The object of the invention is to meet the disadvantages of the known method and device respectively.

According to the invention this objective can be accomplished in that use is made of a tube having a constant diameter along at least substantially its entire length, whose bottom end, along which the end of the helical blade extends, is conical, whereby, when the tube is being withdrawn from the ground, concrete is supplied under pressure and pressed out of the tube via the discharge opening, a closing means of said discharge opening being opened under the influence of the pressure exerted by the concrete.

When using the method according to the invention the tube can be screwed into the ground while effectively compacting the earth surrounding the tube, whilst the concrete can be pressed into the hole formed by the tube while maintaining an effective pressure when the tube is being withdrawn in a non-rotating manner.

According to a further aspect of the invention a particularly advantageous embodiment of a hollow earth drill for drilling holes in the ground with a view to making concrete foundation piles in the ground, with a tube provided with a helical blade on its periphery, can thereby be obtained if the tube has a constant diameter along at least substantially its entire length, whilst the bottom end of the tube, along which the end of the helical blade extends, is conical and is provided with a discharge opening, which can be closed by means of a valve pivotally connected with the tube.

When using this construction a hollow earth drill having a particularly simple design can be obtained, by means of which an even displacement and compaction of the earth around the tube can be obtained when the tube is being screwed into the ground, whilst the valve can be pressed open by means of the concrete supplied through the hollow tube and being under pressure, in order to make it possible that concrete is pressed into the hole formed by the tube at the correct pressure.

The invention will be further explained hereinafter with reference to a possible embodiment, diagrammatically illustrated in the accompanying figures, of a tube provided with a helical blade.

Fig 1 is an elevational view of a part of a tube for drilling a hole in the ground.

Fig 2 is a larger-scale illustration of the lower part of the tube, with a valve closing the bottom end of the tube in the closed position.

Fig 3 is an elevational view, corresponding with Fig 2, of the valve in the open position.

Fig 4 is an elevational view of Fig 3, seen according to the arrow IV.

For drilling holes in the ground with a view to making concrete foundation piles in the ground use is made of the tube 1 illustrated in Fig 1, which tube may have any desired length and may be built up of several sections to be coupled with each other. The preferably thick-walled tube 1 has a constant diameter along at least substantially its entire length, whilst in the interior of the tube 1 there is provided a central passage 2 extending along the entire length of the tube.

Around the outer periphery of the tube 1 there is provided a helical blade 3, which extends along
the entire length of the tube and also along the conical bottom end 4 of the tube, therefore.

In said conical end 4 there is provided an opening 5 in the wall of the tube, which opening can be closed by means of a valve 6. As appears from the Figs 2 and 3 said valve 6 is coupled to the tube 1 by means of a pivot pin 7 extending upwards and being located near one side of the valve 6. The valve 6 can thereby pivot freely about the pivot pin 7 between the position illustrated in Fig 2, in which the valve 6 closes the opening 5, and an open position illustrated in Fig 3.

As appears from the Figs 2 and 3 the lower part 8 of the valve 6 thereby forms the point of the tube 1 in the closed position, so that in the open position of the valve the opening 5 not only extends into the side of the conical end 4, but also along the bottom end of the tube, so that the tube is open at its bottom side then.

When the tube is being screwed into the ground the earth around the hole formed by the tube will be compacted. Because the pivot pin 7 is located in front of the valve 6, seen in the direction of rotation, when the tube is being screwed into the ground, the valve 6 will be automatically kept in its closed position thereby.

After the tube has been screwed into the ground to the desired depth, concrete can be pressed to the bottom end of the tube through the passage 2. When the tube is being withdrawn the valve 6 will be pressed open automatically by the concrete which is under pressure, so that when the tube is being screwed back the concrete is pressed into the hole formed by the tube at the correct pressure.

Before the injecting of the concrete is started it will for example be possible to place a central steel reinforcing rod in the passage 2. Because an opening is also formed at the bottom side of the tube when the valve 6 opens said reinforcing bar can remain behind in the ground, surrounded by the injected concrete, when the tube 1 is being screwed back. After all the concrete required has been injected and the tube 1 has been removed from the borehole, it will also be possible to vibrate a reinforcement basket of reinforcing steel into the fresh concrete by means of a vibrating means. Also it will be possible for any desired profiles or the like to be vibrated into the fresh concrete.

Forming the concrete foundation pile in the ground can be done in the desired manner by measuring the torque exerted on the tube 1 when the tube is being screwed into the ground, and/or by controlling the pressure at which the concrete is being pressed into the borehole when the tube 1 is being withdrawn, dependent on and related to the depth at which the outlet opening at the bottom end of the tube is located. These parameters can also be registered simultaneously during operation.

Instead of a thick-walled tube 1 also a double-walled tube may be used.

Dependent on the requirements made of a foundation pile and its dimensions the external diameter of the helical block may vary between e.g. 320 - 620 mm and the external diameter of the tube 1 may vary between e.g. 220 - 420 mm.

The diameter of the passage 2 is 125 mm thereby.

Of course also other values are conceivable within the scope of the invention.

Claims

1. Method for providing concrete foundation piles in the ground, whereby a tube provided with a helical blade on its periphery is screwed into the ground to the desired depth, after which, while the tube is being withdrawn, concrete is introduced in the hole formed by means of the tube through the interior of the tube, via a discharge opening located near the bottom side of said tube, characterized in that use is made of a tube having a constant diameter along at least substantially its entire length, whose bottom end, along which the end of the helical blade extends, is conical, whereby, when the tube is being withdrawn from the ground, concrete is supplied under pressure and pressed out of the tube via the discharge opening, a closing means of said discharge opening being opened under the influence of the pressure exerted by the concrete.

2. Method according to claim 1, characterized in that a reinforcing rod is first placed in the tube before concrete is supplied under pressure.

3. Hollow earth drill for drilling holes in the ground with a view to making concrete foundation piles in the ground, with a tube provided with a helical blade on its periphery, characterized in that the tube has a constant diameter along at least substantially its entire length, whilst the bottom end of the tube, along which the end of the helical blade extends, is conical and is provided with a discharge opening, which can be closed by means of a valve pivotally connected with the tube.

4. Hollow earth drill according to claim 1, characterized in that the point of the conical part of the tube forms part of the valve.

5. Hollow earth drill according to claim 3 or 4, characterized in that the valve is pivotable about an upwardly extending pivot pin, relative to the conical part of the tube.

6. Hollow earth drill according to claim 5, characterized in that, seen in the direction of rotation of the tube when being screwed into the ground, the pivot pin is located in front of the valve.
**DOCUMENTS CONSIDERED TO BE RELEVANT**

<table>
<thead>
<tr>
<th>Category</th>
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<th>Relevant to claim</th>
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<tr>
<td>A,D</td>
<td>US-A-3 875 751 (PAUS) * Column 1, lines 63-67; column 2, lines 1-3; column 4, lines 35-46; column 5, lines 5-19; column 6, lines 38-46,54-60; column 7, lines 50-52; column 8, lines 36-67; column 9, lines 36-67; figures 11,12,14,16 *</td>
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<td>A,D</td>
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**TECHNICAL FIELDS SEARCHED (Int. Cl.5)**

| E 02 D |

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

**Place of search** | **Date of completion of the search** | **Examiner**
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