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METHOD OF ANCHORING RODS OR THE LIKE IN DRILL HOLES IN EARTHS OR ROCKS

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8 Claims

ABSTRACT OF THE DISCLOSURE

There is disclosed a method of anchoring a rod in a drilled hole, the method comprising the steps of first drilling the hole by employment of a drill head secured on the rod to be anchored, there also being affixed to the connected rod and drill head a tube larger than the rod and smaller than the hole and arranged to provide a flow passage into the hole about the rod and out of the hole about the tube, flushing out the hole as it is being drilled by fluid pressure directed through the flow passage, removing the tube from the hole while leaving the rod and drill head therein, and while removing the tube pressing a rod anchoring binding material through the flow passage into the hole to fill the hole about the rod and drill head retained therein thus to securely anchor the rod in the hole.

The present invention relates to a method by which the above drawbacks and difficulties will be completely eliminated, and by which the rod in question will at every time extend all the way down to the bottom of the drilled hole, and further an absolutely complete and tight filling-up of the space around the rod in the drill hole is obtained with the greatest ease and swiftness.

The method according to the invention is substantially characterized in that a hole is first drilled by means of a rod and a drilling crown provided on the rod, the crown having an at least slightly greater effective or active diameter than a tube surrounding the drilling rod, and in that thereupon a cement mortar or bonding means is pressed through the tube and into the drill hole during simultaneous or successive withdrawal of the tube out of the hole.

A flush medium may be pressed into the tube during the drilling operation, preferably at the upper end of the latter and permitted to escape along the space worked up by the drill crown around the tube, and the binding means may suitably be forced in a more or less direct succession to the interruption of the drilling work and the flush medium supply.

As a binding means any suitable binding means may be utilized, e.g. any cements mortars or bonds.

The flush medium and the subsequent binding or bonding means may advantageously be forced or pressed into the tube through a sleeve means with a socket sealingly connected to the tube and the drill rod and provided with a connection for a supply line.

The rod and the tube may consist of interconnectable parts.

In the appended drawing a device is shown which is suitable for method according to the invention.

The shown device consists of two rods 1 interconnected by a sleeve 2, the inner rod being in a drilled hole and provided with a drill crown 3. The rods 1 serve both as drill rods and as anchoring members in the drill hole, and they may be made of a steel suited to anchoring purposes or of any material which does not need to have any interior flush or rinsing hole or passage.

The rods 1 are surrounded by two tube parts 4 interconnected by a coupling part 5 the diameter of the tube parts being at least slightly less than the effective or active outer diameter of the drill crown. Hereby a space is formed, during the drilling, between the tubes 4 and the walls of the drilled hole.

A distance sleeve or the like 7 in sealing relation with the rod 1 is fixed at the upper portion of the upper rod 1 by a securing pin 6. Against the distance sleeve a sleeve member 9 is sealed by means of a sealing ring 8, the sleeve member 9 being provided with a pipe socket 10 forming an inlet for any flush medium, e.g. water or air, serving to remove drill chips from the drill hole.

The sleeve member 9 is also tightly connected to a tube neck 11 with a lower cylindrical portion 12, which is received in the upper end of the upper tube part 4. A flange 13 of the tube neck 11 determines the relative position of the tube 4 and the neck 11.

Owing to the sealing relation between the parts 7, 8, 9, 11, 12 and 4 a flush medium forced in through the pipe socket 10 and will move downwards between the rods 1 and the tube parts 4. A portion 14 of the drill crown 3 presents passages or channels 15 which conduct the flush medium to the impact portion of the drill crown, which works on the earth in which the drilling is accomplished. From here the flush medium, carrying with it the drill chips, is pressed up between the walls of the drill hole and the outer wall of the pipe parts 4. The arrows indicated in the figure show the flow of the flush medium.

When the drilling operation has been going on for a sufficient time, under a suitably continuous supply of flush medium in the above described way, so that a sufficiently deep or long anchoring hole is obtained, the drill rods 1 and the drill crown 3 are retained in their deepest position in the drill hole, and instead of the flushing liquid, a binding or bonding means, e.g. cement mortar or other serviceable binding means is now pressed through the pipe socket 10. This pressing-in of binding means is continued until it is observed that the space between the rods 1 and the tube parts 4 has been filled or, as may occur with thin binding means, until binding means penetrate to the ground surface. Thereafter a withdrawal of the tube parts 4 from the hole is started under continued and preferably constant pressing-in of binding means. To this end it is of course required that the shackle 6 be removed so that no obstacle exists to a movement upwards of the members 7 and 9 or of the tube parts connected to the latter and other members. When the upward movement has continued so far that the sleeve 7 no longer seals against the upper rod 1, a sealing lid, not shown, is applied to the upper end of the sleeve 7, e.g. by not shown threads, fittings, any other means. The pressing in of binding means
through the pipe socket 10 may then be continued under slow or successive withdrawal of the tube parts 4 until all the drill hole has been tightly pressed to the full extent with binding means.

The pressure of binding means, which may be pressed in under considerable pressure, assures during all the withdrawal operation of the tubes 4 and the members connected to the latter that the drill crown 3 is firmly retained down against the bottom of the drill hole, thereby also retaining firmly the rods 1 connected to each other and to the drill crown.

By the method according to the invention a hundred percent complete filling up of the drill hole is obtained and consequently a never before surpassed firm anchoring of the rods 1 in the drill hole. The circumstance that the drill crown 3 also is left in the drill hole together with the rods 1 has no practical importance, as the drill crown regarding its one-time use may consist of a less expensive material.

It is obvious that the present invention also involves the important advantage that a complete filling up with binding means will also be obtained in the deepest drill holes, so that a never before attained anchoring strength is obtained. This means of course a very great advantage especially in grounds of bad quality. Thus any number of rods 1 may quite simply be joined together for drilling holes for anchoring members.

The sleeve 7 may be secured in the sleeve 9, so that it is not pressed out of the sleeve 9 by the pressing in of the binding means. Instead of applying a lid on the upper portion of the sleeve 9 it is of course also possible to obstruct the hole in the sleeve 7 after withdrawal of the tubes and the members connected thereto.

The device shown is only cited as an example of the method according to the invention, as other embodiments of the device are possible within the scope of the invention.

Thus, other devices for the pressing-in of the flush medium as well as the binding means into the upper end of the tube 4 than the here shown sleeve 9 and the associated members may be employed, e.g., to seal the upper end of the upper tube against the upper rod 1 and to introduce flush medium and binding means through an opening in the wall of the tube part.

The uppermost rod part 1 may have loops, hooks, etc., other forms or formations for attaching articles.

The binding means may be of a kind suited also for earth injection or grouting, whereby at the same time a reinforcement of a weak ground is obtained.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined in the following claims:

1. The herein described method of anchoring a rod in a drilled hole in the earth, said method comprising the steps of first drilling the hole by employment of a drill head secured on an end extremity of the rod which is to be anchored, there being provided and freely surrounding the rod and a portion of the drill head a tube having an inner diameter greater than the outer diameter of the rod and an outer diameter smaller than the drilling diameter of the drill head and the inner diameter of the hole being drilled with spacing provided at the portion of the tube freely surrounding the drill head thereby to provide a flow passage into the hole between the tube and rod and said drill head surrounding tube portion and out of the hole between the tube and the drilled hole wall, driving the drill head by applying power directly to the rod with the tube being stationary, flushing out the hole as it is being drilled by fluid pressure directed through said flow passage, removing the tube from the hole while leaving the drill head and rod in place therein and while removing the tube pressing a rod anchoring binding material through the flow passage and into the hole to fill the hole about the rod and drill head retained therein (thus to securely anchor the rod in the hole.

2. A method as defined in claim 1 wherein the pressing-in of the binding material follows closely after interruption of the drilling and flushing of the hole.

3. A method as defined in claim 1 wherein the flushing fluid and the binding material are pressed into the tube through a sleeve means suitably provided with a pipe socket sealingly engaging with the tube and the rod.

4. A method as defined in claim 1 wherein the rod and tube comprise interconnected sections.

5. A method as defined in claim 2 and wherein the flushing fluid and the binding material are pressed into the tube through a sleeve means suitably provided with a pipe socket sealingly engaging with the tube and the rod.

6. Apparatus comprising a rod to be anchored in the ground, a drill head secured on an end extremity of the rod, a tube freely surrounding the rod and a portion of the drill head and devoid of driving connection with said rod and drill head and having an inner diameter substantially greater than the outer diameter of the rod and an outer diameter substantially smaller than the drilling diameter of the drill head and a hole in the ground to be drilled thereby and with spacing provided at the end of the tube surrounding said drill head portion thereby to provide a flow passage downwardly between rod and tube and upwardly about the exterior of the tube, the rod being readily detachable and subject to being retained in the drilled hole while binding material is being pressed into the hole through the tube and the tube is being withdrawn away from the rod and drill head being anchored in the ground.

7. Apparatus comprising a rod to be anchored in the ground, a drill head secured on an end extremity of the rod, a tube freely surrounding the rod and a portion of the drill head and devoid of driving connection with said rod and drill head and having an inner diameter substantially greater than the outer diameter of the rod and an outer diameter substantially smaller than the drilling diameter of the drill head and a hole in the ground to be drilled thereby and with spacing provided at the end of the tube surrounding said drill head portion thereby to provide a flow passage downwardly between rod and tube and upwardly about the exterior of the tube, the rod being readily detachable and subject to being retained in the drilled hole while binding material is being pressed into the hole through the tube and the tube is being withdrawn away from the rod and drill head being anchored in the ground, sleeve means and a tube socket sealingly engaging with the tube and through which flushing fluid and binding material can be introduced into the tube, and a distance sleeve sealingly and thackle connected to the rod and the tube.

8. Apparatus as defined in claim 7 wherein the rod and tube are composed of connected sections.

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