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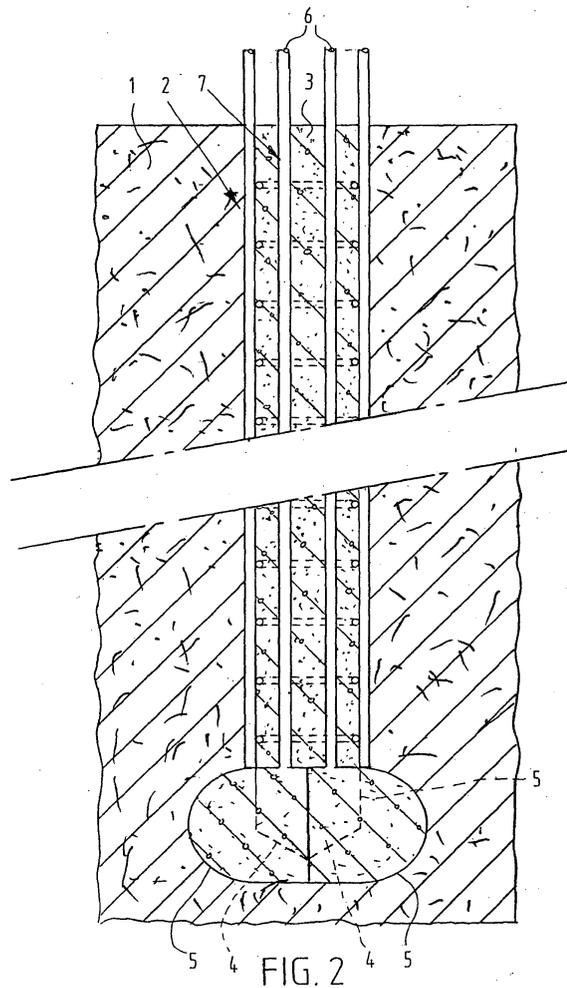
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(54) **Pile-like foundation element with inflatable body**

(57) The invention relates to a pile-like foundation element for arranging or forming in the ground which is provided with a head (3) and a tip (4), wherein the foundation element comprises an inflatable body (5) arranged at least close to the tip and filling means (6) connecting to the inflatable body for filling the inflatable body with a filling material.



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## Description

**[0001]** The present invention relates to a pile-like foundation element for arranging or forming in the ground which is provided with a head and a tip.

**[0002]** It is known to provide pile-like foundation elements with an enlarged pile tip or pile foot so as to obtain a foundation pile with a higher bearing capacity for tensile and compressive forces. At constant load such a pile can be given a shorter form than in the case of a pile without enlarged pile tip or pile foot, which results in a cost-saving. Constructions known from the prior art for forming an enlarged pile tip or pile foot entail relatively high costs and additional required equipment.

**[0003]** The object of the present invention is to provide an improved pile-like foundation element wherein the above stated drawbacks are obviated.

**[0004]** A pile-like foundation element according to the invention for arranging or forming in the ground is characterized for this purpose in that the foundation element comprises an inflatable body arranged at least close to the tip and filling means connecting to the inflatable body for filling the inflatable body with a filling material. The inflatable body is placed at the bottom of the driving tube or drilling tube during pile-driving or drilling to depth or after the desired depth has been reached. After reaching the desired depth, the drilling tube or driving tube is filled wholly or partially with concrete. After the driving tube or drilling tube has been removed from the ground, the inflatable body is filled under pressure with a curing liquid whereby it acquires a greater volume. An enlarged pile tip or pile foot is formed due to the greater volume.

**[0005]** For placing purposes the inflatable body is preferably fixed to the reinforcement for the pile-like foundation element. Reinforcement can consist of standard reinforcing steel or steel profiles, wherein one or more injection tubes are used as filling means for inflating the inflatable body. In an advantageous embodiment the reinforcement comprises at least one hollow pipe as filling means, or in an even more advantageous embodiment the reinforcement consists of hollow pipes connecting to the inflatable body for filling thereof with a filling material.

**[0006]** The filling material is preferably a curing liquid, for instance cement grout.

**[0007]** Protective means can further be provided for protecting the inflatable body. The protective means can optionally also ensure that, when several inflatable bodies are used, they do not affect or impede each other during inflation.

**[0008]** For a further increase in the bearing capacity of the pile-like foundation element, one or more inflatable bodies can also be arranged at a distance from the pile tip.

**[0009]** In order to obtain a uniform load on the ground, the inflatable body or the inflatable bodies is or are preferably inflated symmetrically.

**[0010]** The inflatable body can consist of thin steel or

plastic. Problems with the connection to the filling means can be prevented by making use of a plastic bag as inflatable body.

**[0011]** The invention will be further elucidated with reference to the accompanying drawing. In the drawing:

Figures 1A-F show different steps for forming a pile-like foundation element according to the present in the ground, and

Figure 2 shows a pile-like foundation element according to another embodiment of the invention.

**[0012]** Corresponding components are designated in the figures with the same reference numerals.

**[0013]** A foundation pile 2 for forming in the ground 1 is provided with a head 3 and a tip 4. Foundation pile 2 is provided close to tip 4 with an inflatable body 5 for the purpose of forming an enlarged pile foot or pile tip. As shown in the embodiment of figure 2, more than one inflatable body 5 can also be provided. Each inflatable body 5 is connected to filling means 6 for filling inflatable body 5 with a filling material.

**[0014]** In the embodiment of figures 1A-F, the filling means are formed by an injection tube 6 connecting to inflatable body 5. In the embodiment of figure 2, filling means 6 consist of a reinforcement 7 provided in foundation pile 2. Reinforcement 7 consists of at least vertical hollow pipes, wherein two inflatable bodies 5 are fixed to the underside of these hollow pipes (close to pile tip 4). A filling material, such as a curing liquid, for instance cement grout, can therefore be introduced into inflatable bodies 5 via the reinforcement 7.

**[0015]** Although not shown in the drawings, protective means can further be provided to protect inflatable body 5, whereby is also possible to achieve that, when several inflatable bodies 5 are used, they do not affect or impede each other during inflation.

**[0016]** Further inflatable bodies 5 can also be provided at different heights, at a distance from pile tip 4.

**[0017]** Inflatable bodies 5 can further consist of thin steel or plastic. Inflatable bodies 5 can be connected properly to filling means 6 by making use of plastic bags as inflatable bodies 5.

**[0018]** The foundation pile 2 to be formed in the ground will be further elucidated with reference to figures 1A-1F. A driving tube or drilling tube 8 is driven or drilled into the ground 1 until the desired depth is reached (figure 1A). An inflatable body 5 with filling means 6 connected thereto is then lowered into the thus formed hole until inflatable body 5 is placed at the bottom of the driving tube or drilling tube 8 (figures 1B and 1C). The drilling tube or driving tube 8 is filled wholly or partially with concrete (figure 1D) and the driving tube or drilling tube 8 is removed from the ground (figure 1E). After removal of driving tube or drilling tube 8 the inflatable body 5 is filled under pressure with a filling material, whereby inflatable body 5 acquires a greater volume (figure 1F). An enlarged pile tip 4 is formed due to the

greater volume, as shown clearly in figure 1F.

**[0019]** According to the invention an enlarged pile tip or pile foot can thus be formed in simple manner on a pile-like foundation element, whereby such a foundation element has more bearing capacity or, at a given load, can be given a shorter form than a foundation element without enlarged pile tip or pile foot. 5

**Claims** 10

1. Pile-like foundation element for arranging or forming in the ground which is provided with a head and a tip, wherein the foundation element comprises an inflatable body arranged at least close to the tip and filling means connecting to the inflatable body for filling the inflatable body with a filling material. 15
2. Foundation element as claimed in claim 1, wherein a reinforcement to which the inflatable body is fixed is provided in the pile-like foundation element. 20
3. Foundation element as claimed in claim 2, wherein the reinforcement comprises at least one hollow pipe, which also serves as filling means. 25
4. Foundation element as claimed in claim 3, wherein the reinforcement consists of hollow pipes connecting to the inflatable body for filling thereof with a filling material. 30
5. Foundation element as claimed in any of the foregoing claims, wherein the filling material is a curing liquid, for instance cement grout. 35
6. Foundation element as claimed in any of the foregoing claims, further comprising protective means for protecting the inflatable body.
7. Foundation element as claimed in any of the foregoing claims, wherein the inflatable body is arranged at a distance from the tip. 40
8. Foundation element as claimed in any of the foregoing claims, wherein the inflatable body or the inflatable bodies is or are inflated symmetrically. 45
9. Foundation element as claimed in any of the foregoing claims, wherein the inflatable body is a plastic bag. 50

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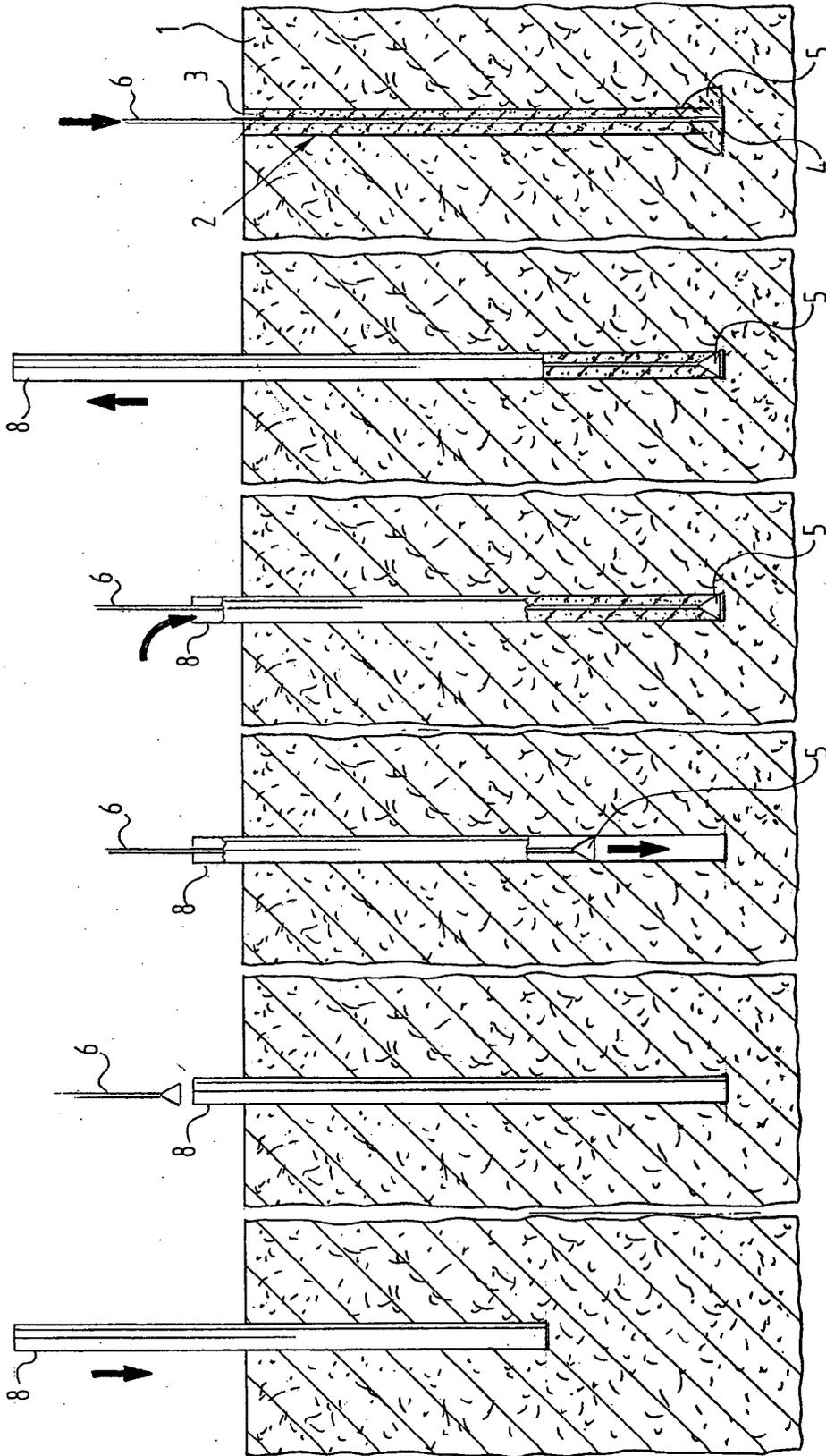
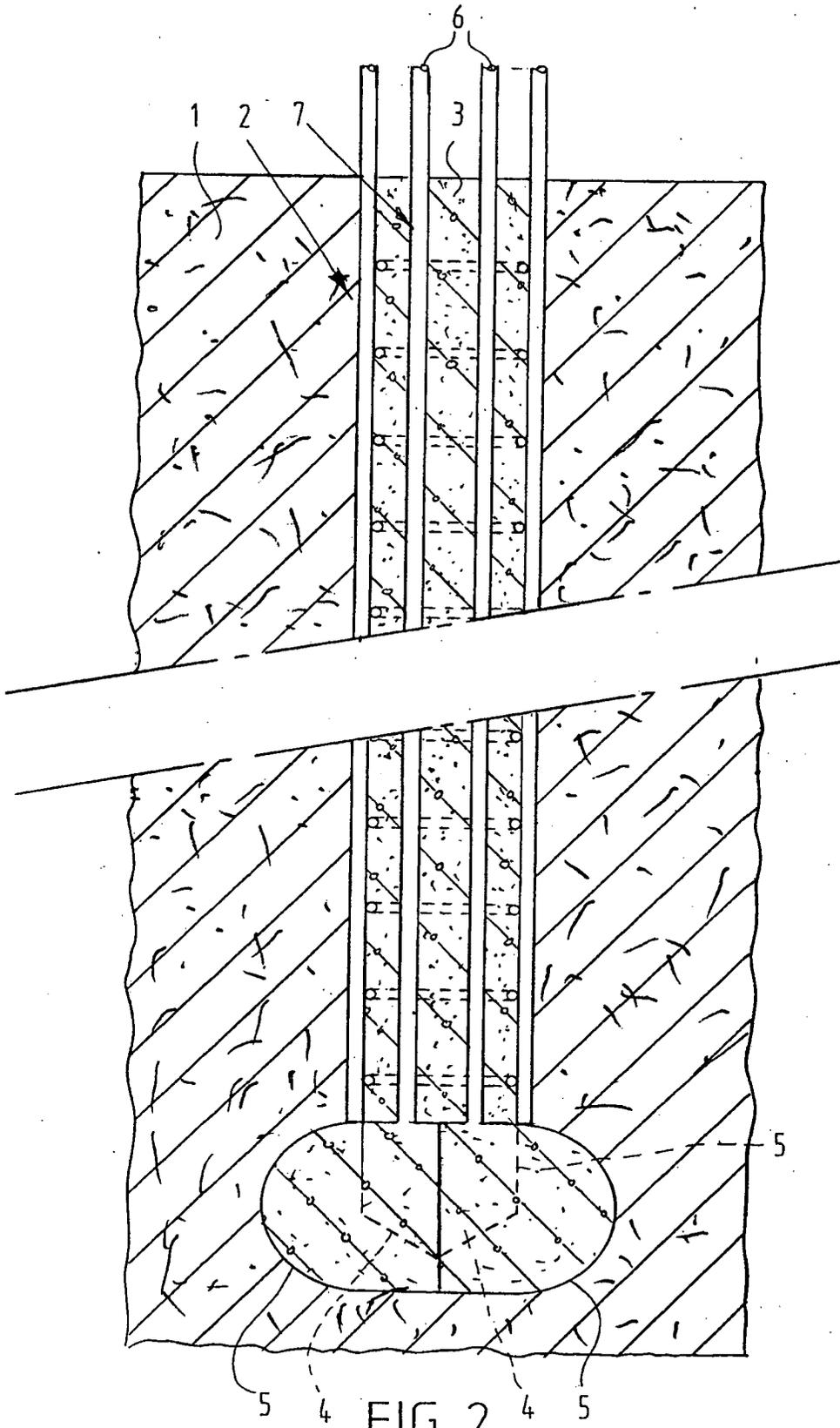


FIG. 1A    FIG. 1B    FIG. 1C    FIG. 1D    FIG. 1E    FIG. 1F





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EUROPEAN SEARCH REPORT

Application Number  
EP 05 07 5930

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		9 August 2005	De Neef, K
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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