(19) DANMARK

(10) **DK/EP 3358086 T3**

Patent- og Varemærkestyrelsen

(12) Oversættelse af europæisk patentskrift

(51) Int.Cl.: ***E 02 D 5/72 (2006.01)*** ***E 02 D 5/54 (2006.01)***

(45) Oversættelsen bekendtgjort den: **2019-11-11**

(80) Dato for Den Europæiske Patentmyndigheds bekendtgørelse om meddelelse af patentet: **2019-08-07**

(86) Europæisk ansøgning nr.: **18154613.6**

(86) Europæisk indleveringsdag: **2018-02-01**

(87) Den europæiske ansøgnings publiceringsdag: **2018-08-08**

(30) Prioritet: **2017-02-01 FI 20175086**

(84) Designerede stater: **AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR**

(73) Patenthaver: **Leino, Jorma, Vuorelantie 10, 27250 Lappi, Finland**

(72) Opfinder: **Leino, Jorma, Vuorelantie 10, 27250 Lappi, Finland**

(74) Fuldmægtig i Danmark: **Budde Schou A/S, Hausergade 3, 1128 København K, Danmark**

(54) Benævnelse: **Pælehoved og fremgangsmåde til fremstilling af en pælespids**

(56) Fremdragne publikationer:
EP-A1- 2 573 274
GB-A- 191 001 196
GB-A- 191 412 929

DESCRIPTION

Object of the invention

[0001] An object of invention is a pile point as defined in the preamble of claim 1. A second object of the invention is a method of manufacturing a pile point, as defined in the preamble of the second independent claim.

Background of the invention

[0002] Deep foundations are often needed when building on a poor soil. A common way of making deep foundations is to use driven piles (for example known from document GB-A-01196). In driven pile foundation, prefabricated piles are driven into the ground using a pile driver. The piles can be constructed of wood, steel or reinforced concrete, for example. The length of the piles depends on the properties of the soil and the load-bearing capacity required from the foundation. If the distance between the ground and the bedrock is short, the piles can be driven to a depth where the lower ends of the pile are seated against the bedrock. In some cases, the friction between the piles and the soil surrounding them can be high enough to allow a sufficient load-bearing capacity to be reached, making it unnecessary to drive the piles down to the bedrock.

[0003] If longer piles are needed, they are often put together from shorter sections, to allow easier transportation and handling of the piles as well as piling also under bridges and other similar places where there is a limited free space available above the ground. The pile sections can be identical to each other but the pile sections driven into the ground as the lowest pile section usually has a tip shaped and reinforced for easy penetration into the soil and durability against the stress caused by the driving. Pile points attached to the lowest piles are often used for piles constructed of reinforced concrete. In case that the piles are to be driven down to the bedrock, special rock points are used. Typically, a rock point has a hard tip part made of quenched steel, for example. The rock point transfers the load of the pile to the rock and prevents the point from sliding. The pile point may comprise a collar part attached to the tip part and surrounding the concrete cast at the end of the pile. The pile point may also comprise gripping members to fix the pile to the concrete cast. In the known pile points, the tip part is attached to the collar part by welding. The pile points are assembled and attached to the piles as they are cast. The known pile points suffer from the problem that they are bulky to transport and store.

Brief description of the invention

[0004] An objective of the invention is to provide a pile point intended for a driven pile and

solving the problems of the prior art. The pile point comprises a collar part which has a first end and a second end and which can be fitted onto an end of the concrete pile to surround the outer periphery of the concrete cast, the second end of the collar part being adapted to be positioned, on the driven pile, closer to the upper end of the pile than the first end of the collar part, as well as a tip part which can be attached to the collar part in such a way that, once the pile point has been assembled to the pile, the tip part extends, in the driving direction of the pile, outwards from the collar part. The characteristics of the pile point according to the invention are disclosed in the characterizing part of claim 1. A second objective of the invention is to provide a method of manufacturing a pile point for a driven concrete pile. The characteristics of the method according to the invention are disclosed in the characterizing part of the second independent claim.

[0005] The first end and the second end of the pile point according to the invention are open, and the collar part and the tip part are shaped to support the tip part, at its outer surface, against the inner surface of the collar part as the tip part is mounted, through the second end of the collar part, into the collar part.

[0006] The method according to the invention comprises the steps of providing a collar part which has a first end and a second end and which can be fitted onto an end of a concrete pile to surround the outer periphery of the concrete cast of the pile, the second end of the collar part being adapted to be positioned, on the driven pile, closer to the upper end of the pile than the first end of the collar part; providing a tip part which can be attached to the collar part in such a way that, once the pile point has been assembled to the pile the tip part extends, in the driving direction of the pile, outwards from the collar part; and mounting the tip part, through the second end of the collar part, into the collar part to support the tip part, at its outer surface, against the inner surface of the collar part.

[0007] The pile point and the method according to the invention have the advantage that the collar part and tip part can be stored and transported as separate items, which is space-saving during storage and transportation. Besides, the pile point can be assembled without having to weld the parts together. The parts can be joined together in a simple way without a machine workshop environment. The invention also allows different collar parts and tip parts to be combined with each other. As an example, a variety of different tip parts can be provided for use with a specific collar part without having to store all the different combinations.

[0008] According to an embodiment of the invention, the surfaces of the collar part and the tip part that come into contact with each other are shaped to comprise sections tapering towards the first end of the collar part. The tapered shape of these sections allows the collar parts to be stacked in a space-saving manner during storage and transportation. Besides, the wedge-shaped contact surfaces join the collar part and the tip part firmly together.

[0009] According to an embodiment of the invention, the pile point also comprises at least one gripping member to fix the pile point to the concrete pile. The gripping members can be ribbed reinforcing bars, for example. The gripping members allow the pile point to be firmly fixed to

the concrete cast of the pile.

[0010] According to an embodiment of the invention, the gripping member can be attached to the pile point by means of threads. Besides, the threads allow also the gripping members to be stored and transported separately from the other parts of the pile point, thus contributing to the space-saving. The gripping members are easy to attach to the pile point without a machine workshop environment.

[0011] According to an embodiment of the invention, the collar part comprises one or more attachment areas for attaching the collar part to the tip part. This ensures that these parts are held together until the pile point is assembled to the pile. The attachment areas can made by hitting or pressing. Therefore, no separate fasteners are needed for attaching the collar part to the tip part.

Brief description of the drawings

[0012] In the following, the embodiments of the invention will be described in more detail with reference to the accompanying drawings where

Figure 1 shows a concrete pile provided with a pile point according to an embodiment of the invention,

Figure 2 is an exploded view of the concrete pile of Figure 1,

Figure 3 shows a pile point according to an embodiment of the invention, and

Figure 4 is an exploded view of the pile point of Figure 3 and of the ribbed reinforcing bars of the pile.

Description of the embodiments of the invention

[0013] Figure 1 shows a concrete pile 1 on which the pile point of the invention can be used. The concrete pile 1 can be used in deep foundations to support a building or a similar construction. In addition to building foundations, the pile 1 can be used under a road, for example. The pile 1 is driven into the ground, to a depth that the tip of the pile 1 meets the bedrock, or that the friction between the soil and the pile is high enough to bear the required load. Many kinds of pile drivers can be used for driving the pile 1 into the ground. In pile driving, generally, the top of the pile is subjected to impacts forcing it into the ground. The pile drivers can use a heavy weight, pressurized air or hydraulic pressure for exerting a force on the top of the pile 1. Many kinds of pile drivers and piling methods are known but they will not be described in more detail herein.

[0014] The length required from the pile 1 varies depending on the properties of the soil at different sites. Besides, piles 1 of different length are often needed at a single site. It is not practical to manufacture piles in different lengths. Besides, long piles 1 can be difficult to transport and handle. Further, at certain construction sites, such as under bridges and other constructions, there can be a limited free space available above the place where the piling takes place. Therefore, the piles are preferably manufactured to a predetermined length, and, if there is a need for longer piles, two or more piles are joined together to create a pile of a suitable length. Figure 1 shows two piles 1. The lower pile 1 of Figure 1 can be used as the lowest pile in foundations. The upper pile 1 of Figure 1 can be assembled to the lower pile 1 to create a longer pile assembly.

[0015] Figure 2 is an exploded view of the lower pile 1 of Figure 1. The body of the pile 1 is made of concrete and provided with at least one reinforcing member 2. The reinforcing members 2 extend through the concrete section in the longitudinal direction of the pile 1 and can be made of steel. In the example shown in Figures 1 and 2, the pile 1 is provided with eight reinforcing members 2 constituted by ribbed reinforcing bars. A binding wire 3 binds the reinforcing members 2 together. The reinforcing members 2 do not have to be straight but other kinds of reinforcing members 2 can also be used.

[0016] The pile 1 has, in its longitudinal direction, a first end and a second end. As the pile 1 is driven into the ground, the first end and the second end constitute the lower end of the pile 1 and the upper end of the pile 1, respectively. The lower pile 1 of Figure 1 is configured to be used as the first, i.e. lowest, pile which is driven into the ground. The first end of the pile 1 is tapered to contribute to the driving of the pile into the ground. In the example shown in Figure 1, the tapered end comprises a pyramid-shaped portion 5 and a cylindrical portion 6 forming the tip of the pile 1. The concrete section of the pile 1 is shielded by a pile point 7. The internal shape of the pile point 7 corresponds to the external shape of the concrete section. The pile point 7 is provided at the first end of the pile 1. The pile point 7 comprises a collar part 7a and a tip part 7b. The pile point 7 can be made of steel. Preferably, at least the tip part 7b is made of quenched steel. The pile point 7 is provided with gripping means 18 by means of which the pile point 7 can be attached to the concrete section.

[0017] In the example shown in Figures 1 and 2, the pile 1 is provided with a heat-transfer pipe 4. A heat-transfer medium can be circulated in the heat-transfer pipe 4 to transfer heat from the ground to the heat-transfer medium or vice versa. Thus, the pile 1 can be used as a part of a geothermal heat system or for storing heat in the ground. However, this is not essential for the present invention, and will therefore not be described in more detail herein.

[0018] The second end of the pile 1 is formed into a concrete surface. The second end is provided with attachment means 10 in order to rigidly attach the pile 1 to the next pile. Herein, the expression "rigidly" refers to that the connection between the piles 1 is able to counteract twisting of the upper pile 1 with respect to an axis parallel to the end surfaces of the piles 1. The pile 1 is also prevented from turning with respect to the longitudinal axis of the piles 1. The

rigid attachment also counteracts pulling in the longitudinal direction of the piles 1.

[0019] In the example shown in Figures 1 and 2, the second end of the pile 1 is provided with four attachment areas. The attachment areas are located in the proximity of the corners of the pile 1. This allows the attachment between the piles 1 to effectively counteract twisting. In the example shown in Figures 1 and 2, each of the attachment areas is provided with two lugs 10. The lugs are U-shaped rods. The legs of the lugs 10 penetrate into the pile 1 and connect to the reinforcing members 2. The lugs 10 protrude from the end surface of the pile 1. The lugs 10 are spaced from each other in each of the attachment areas. A semicircular groove 11 extends from a lateral face of the pile 1 and through the lugs 10 of each of the attachment areas. A semicircular recess 12 is provided adjacent to each of the lugs 10. The first end of the next pile 1 is provided with a similar arrangement. However, the lugs 10 and the recesses 12 are displaced in the direction of the grooves, resulting in that, as the first end of the upper pile 1 is seated on the second end of the lower pile 1, the lugs 10 of each of the piles 1 are received into the recesses 12 in the end surface of the adjacent pile 1. Figure 1 also shows locking pins 13. Once the piles 1 rest against each other, the locking pins 13 are inserted into the grooves 11 and through the lugs 10 in order to ensure attachment. Some other way of attaching the piles 1 to each other can also be used.

[0020] In Figure 1, both of the ends of the upper pile 1 as well as the upper end of the lower pile 1 are provided with a collar 16. The collars 16 are made of a sheet material, such as steel. The collars 16 serve to shield the ends of the pile 1 during the handling and transportation of the piles 1. The piles 1 can also be made without the collars 16.

[0021] The piles 1 are made by casting. A mold is provided for the casting. The mold used for the casting is an elongated trough whose shape corresponds to the shape of the piles 1. The mold has a bottom and lateral walls. The mold can also have one or two end walls. The mold is at least partly open at the top to allow concrete to be poured into the mold. Before the concrete is poured into the mold, the reinforcing members 2 and the heat-transfer pipes 4 are provided inside the mold and fastened to appropriate points. The fastenings means 10 and any other parts required at the ends of the pile 1 are provided at an end, or the ends, of the mold. The concrete is poured into the mold and, after the cast pile has reached the required strength, the pile 1 is taken out of the mold.

[0022] Figure 3 shows a pile point 7 according to an embodiment of the invention. The pile point 7 shown in Figure 3 is a rock point, especially suitable for use on piles 1 which will be driven down to the bedrock, or, which probably will be driven down to the rock. A rock pile is also used when the pile is driven into a stony or rocky layer of soil. However, a rock point can also be used in other foundation conditions. The tip of the rock point is engineered to transfer the load of the pile 1 to the rock and to prevent the pile point 7 from sliding. The rock point is configured to withstand of a tension of at least 28 MPa during the driving of the pile 1.

[0023] The pile point 7 comprises a collar part 7a and a tip part 7b attached thereto. The pile point 7 shown in Figure 3 also comprises gripping members 18 constituted by ribbed

reinforcing bars. However, the gripping members 18 are not necessary for all uses and other gripping members 18 than ribbed reinforcing bars can also be used. In the embodiment shown in the Figures, the gripping members 18 are connected to the tip part 7b. The only attachment of the gripping members 18 to the pile point 7 is via the tip part 7b. This allows the tip part 7b to be directly fixed to the concrete cast of the pile 1 in a firm way.

[0024] The collar part 7a is shaped to fit onto the end of the concrete section of the pile 1. As the pile point 7 is attached to the pile 1, the collar part 7a surrounds the outer periphery of the concrete section of the pile 1. The pile point 7 shown in Figure 3 is shaped to be suitable for a pile having a square cross-sectional profile. The pile point 7 can also be adapted for other cross-sectional profiles. The collar part 7a has a first end and a second end. The terms "a first end" and "a second end" correspond to the terms used for the pile 1 previously herein. That is, as the pile point 7 is mounted on the pile 1, the second end is located closer to the upper end of the pile 1 that the first end. The collar part 7a is open at its both ends. The collar part 7a can be made, for example, of steel, such as carbon steel. The collar part 7a can be made by deep drawing, for example. However, it can also be made from plate sections by welding, for example.

[0025] The tip part 7b is attached to the collar part 7a. The tip part 7b comprises a fastening portion 8 and a tip portion 6. In the position of use of the pile point 7, the tip portion 6 is the lowest part of the pile point 7. In the embodiment shown in Figure 3, the tip portion 6 is cylindrical. Thus, a planar surface, parallel to the ground in the position of use of the pile 1, is provided at the end of the pile 1. Thus, the tip part 7b is capable of bearing high forces. The diameter of the tip portion 6 is clearly smaller than that of the pile 1. The fastening portion 8 fastens the tip part 7b to the collar part 7a. The fastening portion 8 has a clearly larger cross-sectional area than the tip portion 6, preventing it from being pressed into the concrete cast during the driving of the pile 1. The collar part 7a and the tip part 7b are shaped to allow the tip part 7b to be attached to the collar part 7a through the second end of the collar part 7a. As the tip part 7b is mounted into the collar part 7a, the tip part 7b is supported, at its outer surface, against the inner surface of the collar part. The tip part 7b extends to the outside of the collar part 7a in the driving direction of the pile 1. The cylindrical tip portion 6 of the tip part 7b is located on the outside of the collar part 7a. The fastening portion 8, in turn, comprises a support face resting against the collar part 7a. The tip part 7b is made of a highly shockproof material, such as suitable steel. The material can be chromium steel, for example. The tip part 7b can be made by forging, for example. Preferably, the tip part 7b is quenched.

[0026] The collar part 7a and the tip part 7b are shaped to not allow the tip part 7b to be removed from the collar part 7a through the first end of the collar part 7a. As the pile point 7 is attached to the pile 1, the tip part 7b is thereby firmly seated between the collar part 7a and the concrete section of the pile 1. In the pile point 7 according to the invention, the collar part 7a and the tip part 7b can be joined together without welding. Thus, the pile point 7 is easy to assemble just before it is attached to the pile 1. This allows the collar parts 7a and the tip parts 7b to be stored and transported separately from each other, and therefore, they require less space. The collar parts 7a and the tip parts 7b can also be manufactured as different

interchangeable parts. As an example, three different tip parts 7b and three different collar parts 7a result in nine different product options for different needs without having to store all the different versions. This would allow the tip parts 7b and the collar parts 7a to be stored separately and any necessary combinations to be put together as required.

[0027] In the exploded view of Figure 4, the different parts of the pile point 7 are shown separated from each other. Figure 4 also shows the reinforcing members, that the ribbed reinforcing bars 2, inside the concrete section of the pile 1, as well as the binding wire 3 binding the reinforcing members together. The collar part 7a and the tip part 7b comprise a first support face 19 and a second support face 20, respectively. The first support face 19 of the collar part 7a is provided on the inner periphery of the collar part 7a. The second support face 20 of the tip part 7b is provided on the outer periphery thereof. As the pile point 7 is assembled, the support face 20 of the tip part 7b is supported against the support face 19 of the collar part 7a. The faces 19, 20 of the collar part 7a and the tip part 7b of the pile point 7 that come into contact with each other are shaped to comprise sections tapering towards the first end of the collar part 7a. In the embodiment shown in the Figures, the tapered sections are pyramid-shaped but other shapes can also be used. Specifically, the tapered sections of a pile point 7 used on a pile 1 with a circular cross-section can be conical. The tapered sections allow the collar parts 7a to be stacked into each other in a space-saving manner during storage and transportation. Besides, the tip part 7b and the collar part 7a are well supported against each other.

[0028] The pile point 7 may also comprise gripping members 18 adapted to fix the pile point 7 to the concrete cast of the pile 1. In the embodiment shown in Figures 3 and 4, the gripping members 18 are constituted by ribbed reinforcing bars. Preferably, the gripping members are removably attached to the pile point 7. The removable gripping members 18 allow them to be attached just before the pile point 7 is needed for use, with the result that they can be stored and transported separately from the other parts of the pile point 7 to save space. The gripping members 18 and the pile point 7 can be provided with external threads and internal threads, respectively. In the embodiment shown in Figures 3 and 4, threaded holes 15 are provided in the tip part 7b to receive the gripping members 18. In the embodiment shown in the Figures, the pile point 7 is provided with four gripping members 18 located in the corners of the pile point 7. However, some other number of gripping members 18 can also be provided.

[0029] As mentioned above, the parts of the pile point 7 can be stored and transported separately. Before the pile point 7 is mounted, the tip part 7b is attached to the collar part 7a. The tip part 7b is mounted into the collar part 7a through the first end of the collar part. The contact surfaces 19, 20 of the tip part 7b and the collar part abut against each other and, thus, the tip part 7b is supported against the collar part 7a. Thereafter, or alternatively before the tip part 7b and the collar part 7a are joined together, the gripping members 18 can be screwed into place. Once the tip part 7b and the collar part 7a has been joined together, the collar part 7a can be externally hit or pressed to form the attachment areas 14. As the attachment areas 14 are formed, the tip part 7b serves as a counterpart against which the attachment areas 14 of the collar part 7a are pressed during the hitting or pressing of the collar part 7a. Thus, a

force is delivered to the collar part 7a in a transverse direction. If the collar part 7a has a square cross-section, as is shown in the Figures, the attachment areas 14 can be formed on each of the four sides of the collar part 7a, or at least two opposite sides thereof. At the attachment areas 14, the collar part 7a is pressed against the tip part 7b, ensuring that the parts will stay in place with respect to each other until the pile point 7 is attached to the pile 1.

[0030] Alternatively, the attachment areas 14 can already be formed on the collar part 7a before the tip part 7b and the collar part 7a are joined together. Thus, the collar part 7a may comprise preformed attachment areas 14 formed by hitting or pressing. The attachment areas 14 constitute portions extending radially inwards on the collar part 7a. The tip part 7b can be attached to the collar part by a snap-fit. As the tip part 7b is inserted into the collar part 7a, it is locked to the attachment areas 14 provided on the collar part 7a. Counterformations can be provided on the tip part 7b to enhance the locking. The preformed attachment areas 14 make the tip part easy to attach in a worksite environment.

[0031] The pile point 7 is attached to the pile 1 as the pile 1 is cast. The pile point is mounted onto an end of the mold. The gripping members 18 can be connected to the reinforcing members 2 of the pile 1. During the casting of the pile 1, the pile point 7 is also filled with concrete, and, thus, the pile point 7 is firmly fixed to the pile 1 being cast.

[0032] It is obvious to a person skilled in the art that the invention is not restricted to the embodiments described above but may vary within the scope of the independent claims.

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- GB01196A [0002]

PATENTKRAV

1. Pælespids (7) til en drevet betonpæl (1), hvilken pælespids (7) omfatter

- en kravedel (7a), som har en første ende og en anden ende, og som kan anbringes på en ende af betonpælen (1) til at omgive den udvendige periferi af den støbte beton i pælen (1), idet den anden ende af kravedelen (7a) er indrettet til at blive placeret på den drevne pæl (1), tættere på den øvre ende af pælen (1) end den første ende af kravedelen (7a), samt
- en spidsdel (7b), som kan forbindes med kravedelen (7a) på en sådan måde, at så snart at pælespidsen (7) er samlet med pælen (1), strækker spidsdelen (7b) sig i drivretningen for pælen (1), udad fra kravedelen (7a),

hvor

- den første ende og den anden ende af kravedelen (7a) er åbne, og kravedelen (7a) og spidsdelen (7b) er formede til at understøtte spidsdelen (7b), ved sin udvendige overflade, imod den indvendige overflade af kravedelen (7a), når spidsdelen (7b) er monteret, via den anden ende af kravedelen (7a), ind i kravedelen (7a), **kendetegnet ved, at**
- overfladerne (19, 20) på kravedelen (7a) og spidsdelen (7b), som kommer i kontakt med hinanden, er udformede til at omfatte sektioner, som tilspidses imod den første ende af kravedelen (7a),
- kravedelen (7a) omfatter ét eller flere fastgørelsesområder (14) til fastgørelse af kravedelen (7a) til spidsdelen (7b), og
- fastgørelsesområderne (14) er udformede ved slag eller presning.

2. Pælespids (7) som angivet i krav 1, **kendetegnet ved, at** fastgørelsesområderne (14) er formede ved udvendigt at slå eller presse kravedelen (7a) imod spidsdelen (7b).

3. Pælespids (7) som angivet i krav 1, **kendetegnet ved, at** fastgørelsesområderne (14) er præformede på kravedelen (7a) til fastgørelse af spidsdelen (7b) til kravedelen (7a) ved snapforbindelse.

4. Pælespids (7) som angivet i ethvert af kravene 1 til 3, **kendetegnet ved, at** pælespidsen (7) også omfatter i det mindste et gribeelement (18) til at fastgøre pælespidsen (7a) til betonpælen (1).

5. Pælespids (7) som angivet i krav 4, **kendetegnet ved, at** gribeelementet (18) kan forbindes med spidsdelen (7b).

6. Pælespids (7) som angivet i krav 4 eller 5, **kendetegnet ved, at** gribeelementet (18) kan forbindes med pælespidsen (7) ved hjælp af gevind.

7. Fremgangsmåde til fremstilling af en pælespids (7) til en drevet betonpæl (1) ifølge ethvert af kravene 1 til 6, hvilken fremgangsmåde omfatter følgende trin:

- tilvejebringelse af en kravedel (7a), som har en første ende og en anden ende, og som kan anbringes på en ende af betonpælen (1) til at omgive den udvendige periferi af den støbte beton i pælen (1), den anden ende af kravedelen (7a) er indrettet til at blive anbragt, på den drevne pæl (1), tættere på den øvre ende af pælen (1) end den første ende af kravedelen (7a),
- tilvejebringelse af en spidsdel (7b), som kan fastgøres til kravedelen (7a) på en sådan måde, at såsnart pælespidsen (7) er samlet med pælen (1), strækker spidsdelen (7b) sig i drivretningen for pælen (1), udad fra kravedelen (7a),
- montering af spidsdelen (7b), igennem den anden ende af kravedelen (7a), ind i kravedelen (7a) til at understøtte spidsdelen (7b), ved sin udvendige overflade, imod den indvendige overflade på kravedelen (7a), og
- formning, ved slag eller presning, af ét eller flere fastgørelsesområder (14) på kravedelen (7a) for fastgørelse af kravedelen (7a) til spidsdelen (7b).

8. Fremgangsmåde til fremstilling af en pælespids (7) som angivet i krav 7, **kendetegnet ved, at** fastgørelsesområderne (14) dannes ved udvendig at slå eller presse kraven (7a) imod spidsdelen (7b).

9. Fremgangsmåde til fremstilling af en pælespids (7) som angivet i krav 7, **kendetegnet ved, at** fastgørelsesområderne (14) er formede på kravedelen (7a) før forbindelsen af kravedelen (7a) og spidsdelen (7b) indbyrdes, idet spidsdelen (7b) kan fastgøres til kravedelen (7a) ved en snapforbindelse.

10. Betonpæl (1) omfattende en sektion fremstillet af armeret beton, **kendetegnet ved, at** en pælespids (7) i overensstemmelse med ethvert af kravene 1 til 6 er fastgjort til betonpælen (1).

DRAWINGS

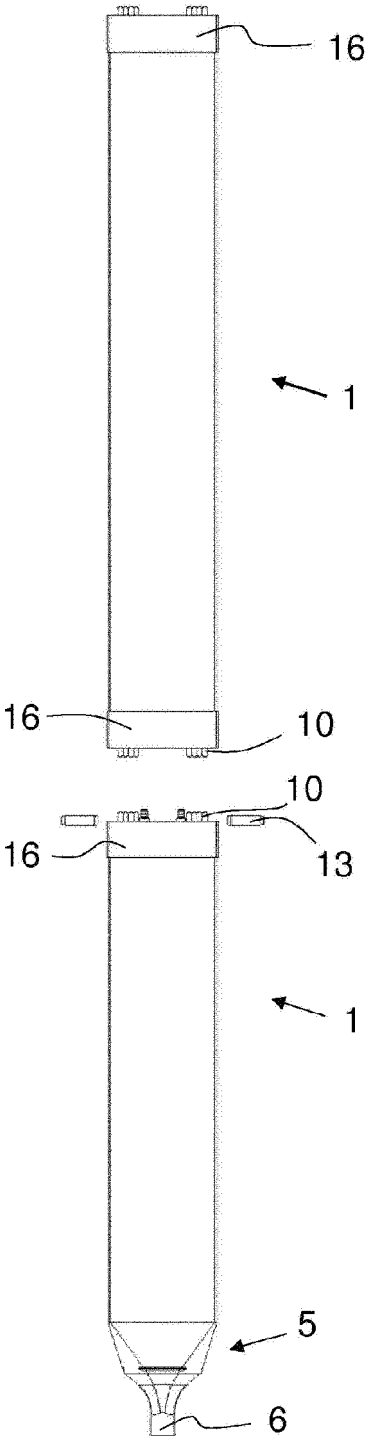

FIG. 1

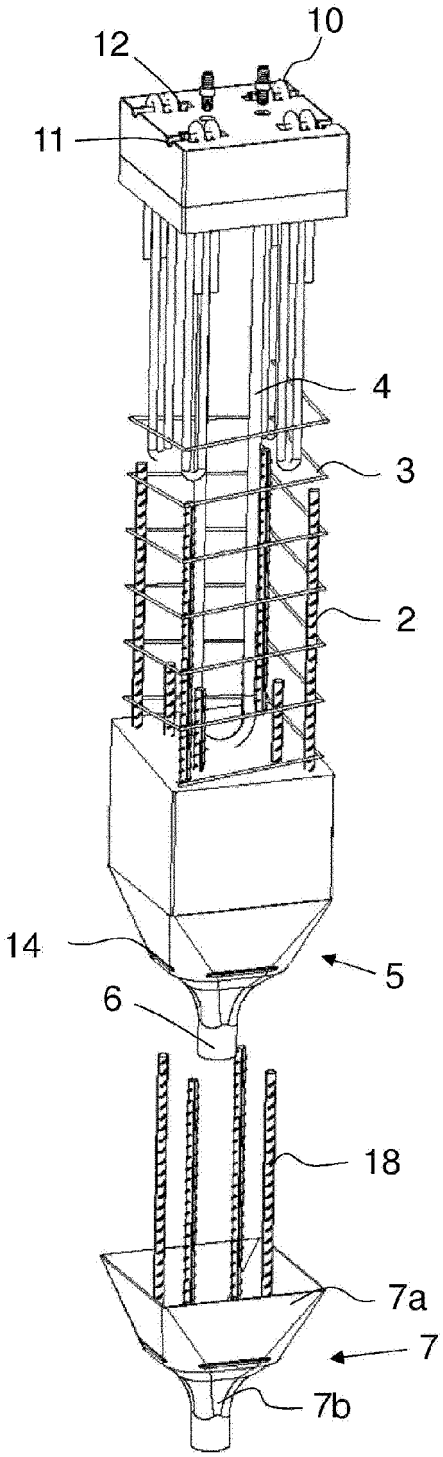

FIG. 2

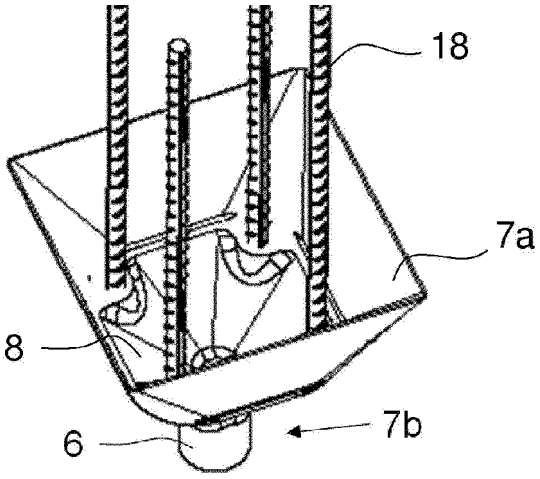

FIG. 3

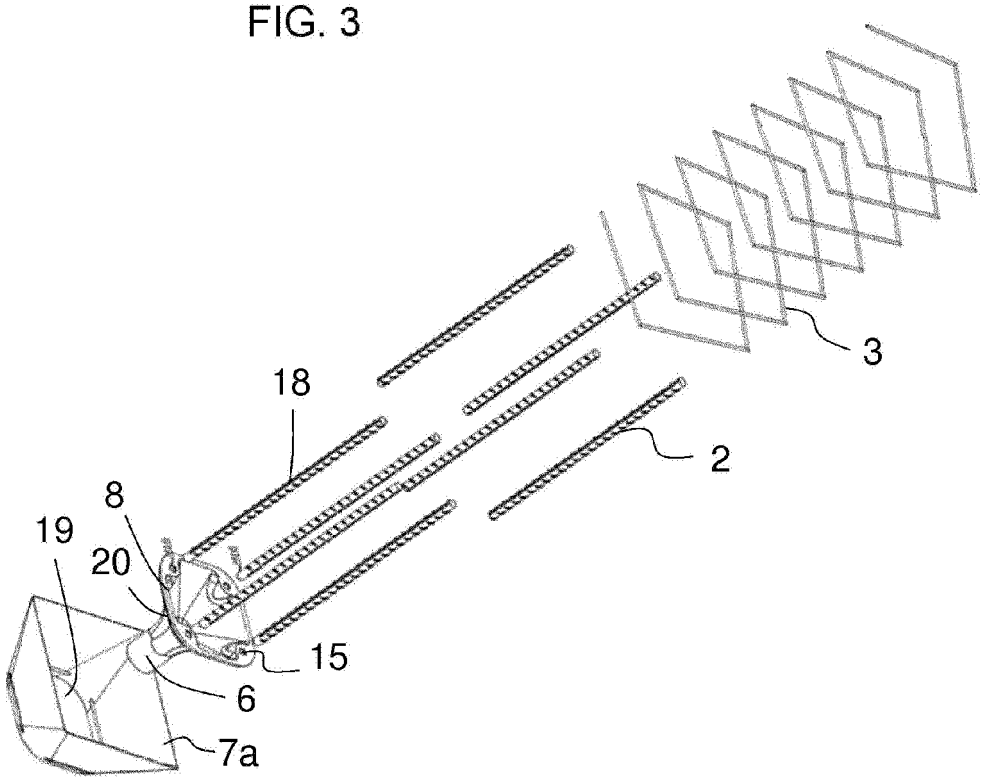

FIG. 4