



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11) **EP 1 482 094 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
01.12.2004 Bulletin 2004/49

(51) Int Cl.7: **E02D 5/38**, E02D 5/72,
E02D 7/28

(21) Application number: **04076531.5**

(22) Date of filing: **25.05.2004**

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IT LI LU MC NL PL PT RO SE SI SK TR**
Designated Extension States:
AL HR LT LV MK

(72) Inventor: **van 't Wout, Pieter**
2741 EW Waddinxveen (NL)

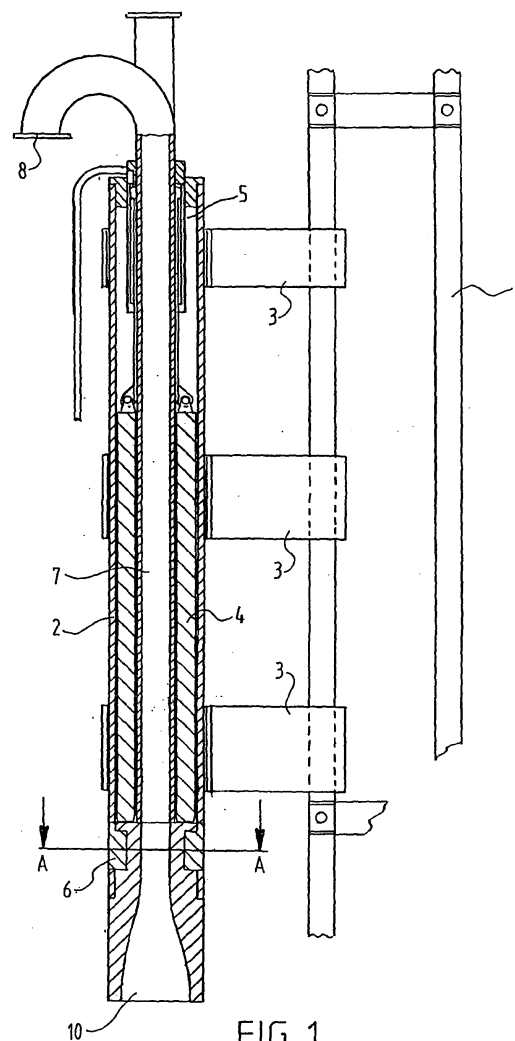
(74) Representative: **Hoorweg, Petrus Nicolaas et al**
Arnold & Siedsma,
Advocaten en Octrooigemachtigden,
Sweelinckplein 1
2517 GK Den Haag (NL)

(30) Priority: **26.05.2003 NL 1023531**

(71) Applicant: **Heifu B.V.**
2741 EW Waddinxveen (NL)

(54) **Apparatus for arranging a pile in the ground for foundation or sheet piling purposes**

(57) Apparatus for arranging a pile in the ground for foundation or sheet piling purposes, which pile consists of concrete or suchlike curable material, which apparatus comprises a vertically standing guide (1), a tube (2) movable up and downward therealong, a ram (4) acting thereon for the purpose of striking or forcing this tube into the ground, means (5) for driving the ram and means for finally retracting the tube from the ground, wherein the tube is provided at the bottom end with a replaceable form part consisting of a first part (12) received close-fittingly in and removably from the cylindrical bottom end of the tube, and a second part (13) which protrudes out of this bottom end and has an outer circumference equal to the desired outer circumference of the pile, so that different piles can be made with the same apparatus.



EP 1 482 094 A1

Description

[0001] The invention relates to an apparatus for arranging a pile in the ground for foundation or sheet piling purposes, which pile consists of concrete or suchlike curable material, which apparatus comprises a vertically standing guide, a tube movable up and downward therealong, a ram acting thereon for the purpose of striking or forcing this tube into the ground, means for driving the ram and means for finally retracting the tube from the ground.

[0002] Such an apparatus is known for instance from FR 676 882. It is generally known to manufacture foundation piles by forcing a retractable tube into the ground, which tube is then filled with a curable material, for instance concrete, optionally provided with a reinforcement. With retraction of the tube the partially cured material with the reinforcement remains in the ground and, after curing, forms a foundation pile which supports on a bearing layer in the ground.

[0003] Such retractable tubes are normally carried into the ground by a ram or by vibration. The tube is sealed on the underside with a lost foot plate which remains behind in the ground. It will be apparent that the form of the pile is determined wholly by the diameter of the tube to be placed in the ground. The invention has for its object to provide an apparatus with which different types of pile can be made in the ground, and not only foundation piles but also piles for sheet piling purposes, for which purpose a sheet pile is formed by carrying a number of piles at a time into the ground parallel to and adjacently of each other, and subsequently filling the intermediate space with piles of other dimensions such that a closed sheet pile is created.

[0004] The apparatus according to the invention is distinguished in that the tube is provided at the bottom end with a replaceable form part consisting of a first part received close-fittingly in and removably from the cylindrical bottom end of the tube, and a second part which protrudes out of this bottom end and has an outer circumference equal to the desired outer circumference of the pile.

[0005] Owing to the replaceable mouthpiece on the bottom end of the tube, which mouthpiece is also closed by means of a lost end flange, the final pile is formed by the dimension of the replaceable part when the tube and mouthpiece are retracted from the ground. Depending on the pile dimension, this dimension can differ from the dimension of the tube, and even have an oval-shaped or even rectangular or square cross-sectional form.

[0006] The invention further relates to an apparatus with which the tube can be forced into the ground with low noise and low vibration, for which purpose the tube is provided with a ram arranged therein. This ram remains together with a stop in the underside of the tube, whereby the sound is blocked by the tube itself. By moreover giving the descending body a hollow form a feed tube can be arranged therethrough, through which

the curable material is carried. The replaceable form part on the underside herein has an axial passage through the first and second part thereof, which has a suitable progression such that the passage connects on one side to the passage of the inner tube and on the other side has an inner configuration adapted to the desired pile form.

[0007] According to the invention the stop in the tube can be formed by two or more ring segments, wherein the replaceable form part is also provided with segments of the same shape such that these can co-act to obtain a releasable connection.

[0008] Above mentioned and other features of the invention will be further elucidated with reference to the figure description hereinbelow of a number of embodiments.

Figure 1 shows a schematic standing side view of an apparatus according to the invention provided with a replaceable form part, figure 2 shows a cross-section along the line A-A in figure 1, figure 3 shows an axial section of the form part on enlarged scale, figures 4 and 5 show an axial section corresponding with figure 3 of a variant of the mouthpiece and a bottom view of the mouthpiece of figure 4, figure 6 shows a second variant of the mouthpiece according to the invention, figure 7 shows a bottom view of the mouthpiece of figure 6.

[0009] Corresponding components are shown in the figures with the same reference numerals.

[0010] Figure 1 shows schematically a vertical guide (1) which can be of random type and which depends on the manner in which the tube (2) is forced into the ground. The tube is held fixedly along guide (1) by means of guided brackets (3) such that it is forced into the ground by means of a ram (4), this being further elucidated below. The ram is movable up and downward in the tube by means of hydraulic cylinders (5) and supports on a stop (6) arranged fixedly in the bottom end of tube (2).

[0011] Ram (4) is already embodied for passage of a feed pipe (7) which is provided on the top end with a connecting flange (8) for supply of the curable material.

[0012] According to the invention there is arranged on the bottom end a mouthpiece (10) which has a particular form and which is arranged removably in the bottom end of tube (2).

[0013] Mouthpiece (10) is shown on larger scale in figure 3. It consists of a cylindrical body (11) which has a narrowed part (12) at the top end and a form part (13) at the bottom end protruding outside tube (2).

[0014] The upper part (12) is embodied with a recess (14) into which protrudes the stop (6) which is fixedly connected to tube (2). Stop part (6) consists of two ring

segments located opposite each other which in the shown embodiment have a width of 90 degrees of arc. In the space between ring segments (6) a protruding flange with the form of a segment of a circle (15) can be fed through in each case above the narrowed part (14). By rotating the form part (11) through 90 degrees these flanges (15) will come to lie on top of stops (6), wherein this angular position can be blocked by means of locking pins or bolts (16).

[0015] In this embodiment the ram (4) will not contact stop (6) directly but via flanges (15). The form part can easily be replaced by another form part by first removing securing bolts (14) and rotating the form part through a quarter-turn, whereby it drops out of the bottom end of tube (2).

[0016] According to the invention the passage D of the form part defines the size or dimension of the foundation pile. The upper part of the passage fits onto the inner diameter of feed pipe (7) and has a smooth progression to the end face (17) that ultimately determines the cross-section of the pile. In figure 3 the diameter of the passage is deemed to be the same over the cross-section, whereby a cylindrical pile is obtained.

[0017] Figure 4 has an oval-shaped passage that can be seen in figure 5. It is also possible to remove the form part from the bottom end, whereby piles can even be made which are thicker than tube (2) and also have a square cross-sectional form, see figure 7.

[0018] As is known, the bottom end of form part (11) is closed during use by a lost end flange (not shown) which remains behind in the ground.

[0019] The method of use is also assumed to be known and has already been described above in the introduction.

[0020] Different variants are possible according to the invention, wherein ram (4) is not arranged in tube (2) in the manner shown but acts on the top of the end part of tube (2). This can be a ram but can equally well be a vibrating unit.

[0021] The invention is not limited to the above described embodiments.

bottom end and has an outer circumference equal to the desired outer circumference of the pile.

2. Apparatus as claimed in claim 1, suitable for forcing the tube into the ground with low noise and low vibration, wherein the ram acts on a stop in the bottom of the tube, which ram has a passage through which an inner tube is arranged for feed of the liquid curable material, **characterized in that** the axial passage of the first and second part has a suitable progression such that it connects on one side to that of the inner tube and on the other side has an inner configuration adapted to the desired pile form.

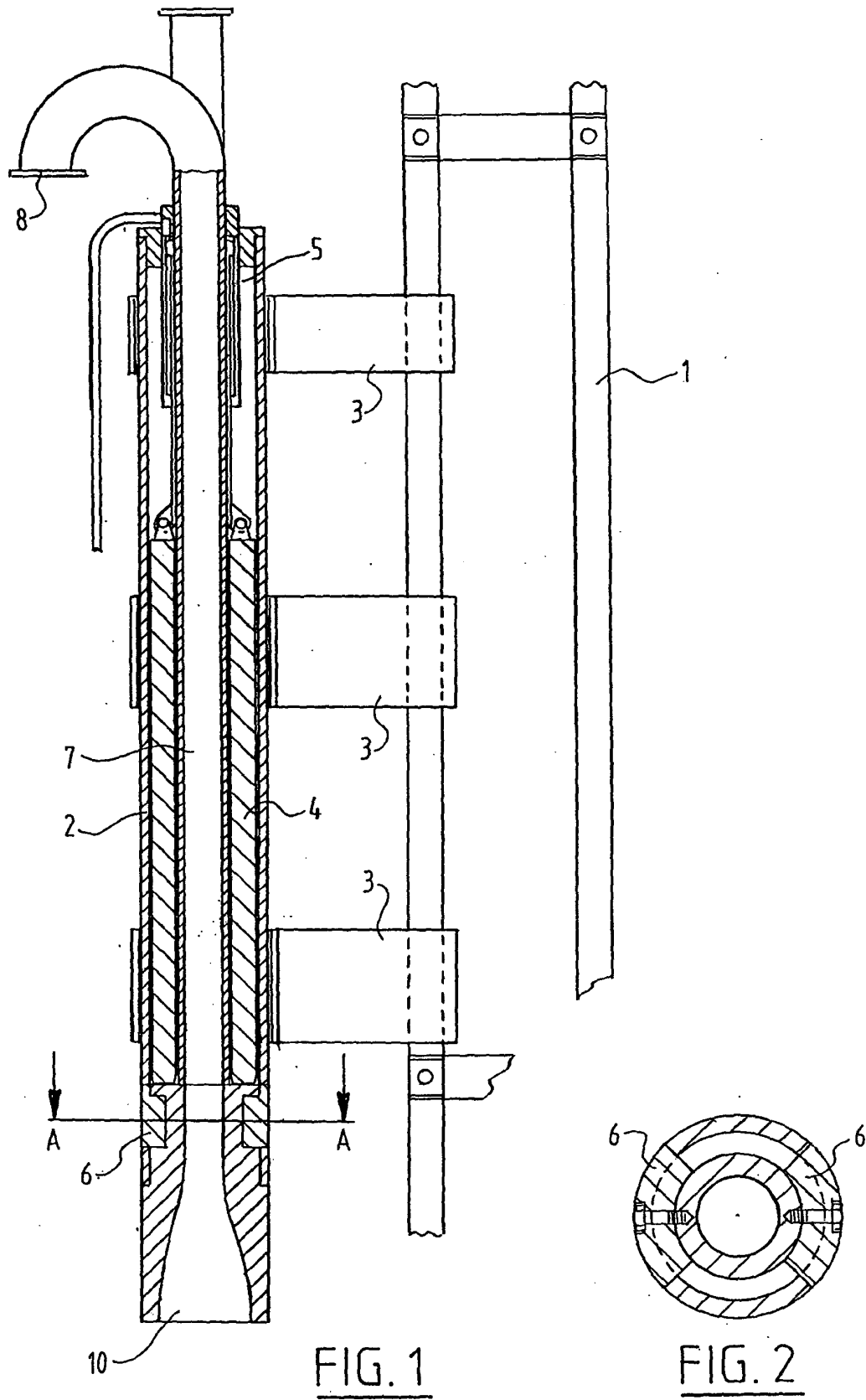
3. Apparatus as claimed in claim 1 or 2, **characterized in that** the stop in the tube is formed by two or more ring segments, and the replaceable form part is provided with segments of the same shape.

4. Apparatus as claimed in claim 2 or 3, **characterized in that** one or more locking pins are arranged in the ring segments.

5. Apparatus as claimed in claims 2-4, **characterized in that** the ram is embodied as a cylindrical body extending between the inner wall of the tube and round the inner tube.

Claims

1. Apparatus for arranging a pile in the ground for foundation or sheet piling purposes, which pile consists of concrete or suchlike curable material, which apparatus comprises a vertically standing guide, a tube movable up and downward therealong, a ram acting thereon for the purpose of striking or forcing this tube into the ground, means for driving the ram and means for finally retracting the tube from the ground, **characterized in that** the tube is provided at the bottom end with a replaceable form part consisting of a first part received close-fittingly in and removably from the cylindrical bottom end of the tube, and a second part which protrudes out of this



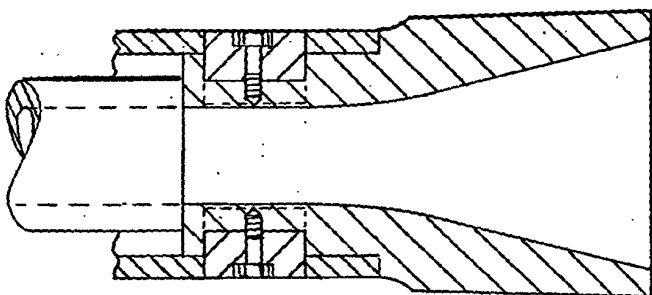


FIG. 6

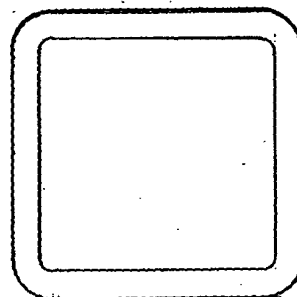


FIG. 7

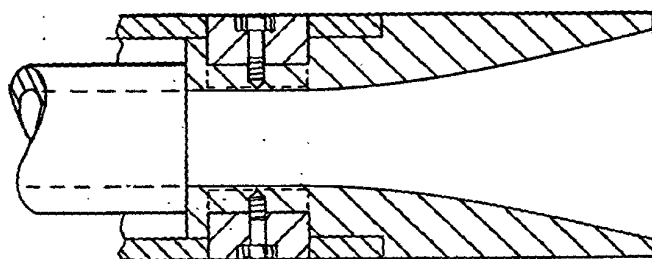


FIG. 4

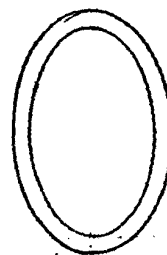


FIG. 5

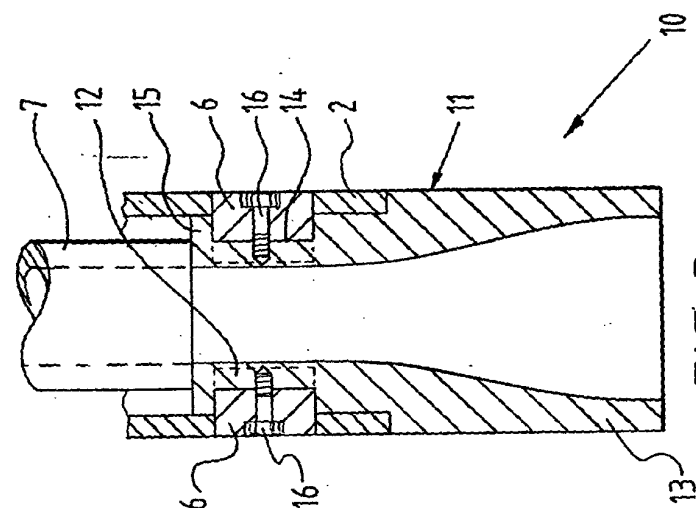


FIG. 3



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 04 07 6531

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
Y	FR 676 882 A (GOUYAUD) 28 February 1930 (1930-02-28) * page 3, line 20 - page 5, line 21; figures 1-6 *	1,2,5	E02D5/38 E02D5/72 E02D7/28
Y	GB 571 637 A (HOOD) 3 September 1945 (1945-09-03) * page 5, line 94 - page 6, line 40; figures 3,4 *	1,2,5	
A	DE 27 27 507 A (MÜLLER) 4 January 1979 (1979-01-04)		
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			E02D
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 23 July 2004	Examiner Kergueno, J
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			

EPO FORM 1503 03/92 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 04 07 6531

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

23-07-2004

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
FR 676882	A	28-02-1930	NONE	
GB 571637	A	03-09-1945	NONE	
DE 2727507	A	04-01-1979	DE 2727507 A1	04-01-1979

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82