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(54) **Method for arranging concrete piles in the ground**

Verfahren zum Herstellen eines Ortbetonpfahles im Boden

Procédé pour la mise en place d'un pieu en béton, monte dans le sol

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Description

[0001] The invention relates to a method for arranging concrete piles in the ground by placing into the ground a hollow cylindrical pipe, filling the interior of the pipe with a reinforcement and concrete mortar and removing the hollow cylindrical pipe from the ground.

[0002] With regard to the generated vibrations and possible resulting damage to the foundations of existing buildings it is not possible or desirable to drive piles into the ground in built-up areas.

[0003] In order to avoid this drawback, hollow cylindrical pipes are carried in rotating or drilling manner into the ground and the interior of the pipe is filled with reinforcement and concrete after it has reached the desired depth. The pipe is then removed from the ground.

[0004] Such a method as disclosed in BE-A-754765 has the drawback that after the concrete pile has been formed in the ground, the pile can still penetrate a certain distance further into the ground due to settling. Such settling, and in particular the distance over which this takes place, is not the same for all piles of a foundation, so that in extreme cases the foundation will move out of the desired horizontal position.

[0005] The invention has for its object to obviate this drawback. This is achieved according to the invention in that an end part is arranged, having a tip shaped part and a helical shaped part on the bottom end of the pipe to be driven into the ground, rotatingly driving said pipe into the ground and finally applying an impact force to the pipe.

[0006] Because the pipe is further rammed for a time, the cylindrical pipe will undergo a settling such that the danger of further penetration of the concrete pile into the ground is avoided. Since this further ramming takes place after the desired bearing layer has already been reached, the degree of vibration generated in the ground will be so small that there is no danger to existing buildings.

[0007] In order to limit still further the danger of damage to surrounding foundations or buildings as a consequence of the further ramming, it is proposed according to the invention that the applied impact force is formed by a ram block lowered into the pipe.

[0008] The ram block can apply the impact force to an inner edge arranged on the bottom end of the pipe. It is also possible for the impact force to be applied by the ram block to concrete poured into the bottom end of the pipe.

[0009] The invention further relates to a pile-driving installation for performing the method according to the invention.

[0010] The invention is further elucidated with reference to the drawings.

[0011] In the drawings:

fig. 1-6 show the different stages for introducing and again removing a cylindrical pipe with a method according to the invention,

fig. 7 shows a preferred embodiment of the pile-driving installation for performing the method according to the invention,

fig. 8 shows an embodiment of the pile-driving installation for performing the method according to the invention, wherein drilling takes place in ground-compacting manner and further ramming takes place with a ram block, while the pipe is pulled by means of the vibrator, this as an embodiment of the BOVI-PILE, and

fig. 9 shows an embodiment of the invention, wherein drilling takes place in ground-compacting manner and the expanded foot is then arranged with a ram block. The pipe is subsequently filled with concrete and the pipe pulled with a vibrator, this as an embodiment of the BOVI-PILE.

[0012] Fig. 1-6 show schematically the manner of arranging a hollow cylindrical pipe and subsequent removal thereof from the ground.

[0013] On the pipe 1, known under the trade name of BOVI-PILE, is placed an end part 2 which has a tip-shaped part 3 as well as a helical part 4. The end part 2 is connected to the pipe by means of a pin-slot connection 5. Using a hydraulic rotation motor 6 the pipe 1 is rotated in the direction of arrow P1 and penetrates in manner of a drill into the ground.

[0014] When the position according to fig. 2 is reached, the pipe is further rammed by means of the ram block 7 such that it is set in operationally reliable manner into the bearing layer in the ground. The reinforcement (fig. 3) and then the concrete mortar (fig. 4) are subsequently carried into the hollow pipe.

[0015] The pipe is then set into vibration using the block (fig. 5) and simultaneously moved vertically upward. The vibration has the purpose of compacting the concrete. The end part 2 is a lost end part and remains behind in the ground. Finally (fig. 6), the hollow pipe is wholly removed from the ground and the concrete pile is formed in the ground. The head of the pile can optionally be finished to height.

[0016] Fig. 7 shows an embodiment of a pile-driving installation according to the invention. A sub-frame 9 is placed on the post 8. A hydraulic rotation motor 12 and a ram block 13 are arranged on sub-frame 9 for rotation round the respective shafts 10 and 11. By swivelling in the direction of arrows P2 respectively P3 the hydraulic rotation motor 12 or the ram block 13 can be carried as desired into the ramming position above pipe 1.

[0017] As is usual, the whole frame can be displaced vertically in the direction of arrow 14 along the post 8.

[0018] According to the embodiment of fig. 8, a ram block 20 is lowered into the pipe for further ramming. This ram block 20 exerts its impact force on an inner edge 21 on the bottom edge of the pipe. In the usual manner the pipe is then filled with concrete and removed from the ground while the vibrator vibrates.

[0019] According to the embodiment of fig. 9, prior to further ramming the pipe is lifted slightly and a quantity of concrete introduced into the thereby resulting space. After compacting with the ram block 20 or further ramming a spherical foot is obtained at the bottom end of the pile which increases the load capacity of the pile. As in the foregoing embodiments, removal of the pipe takes place using a vibrator.

Claims

1. Method for arranging concrete piles in the ground comprising placing into the ground a hollow cylindrical pipe (1), filling the interior of the pipe with a reinforcement and concrete mortar and removing the hollow cylindrical pipe from the ground, said method being **characterized by** arranging an end part having a tip shaped part (3) and a helical shaped part (4) on the bottom end of the pipe to be driven into the ground, rotatingly driving said pipe into the ground and finally applying an impact force to the pipe.

2. Method as claimed in claim 1, **characterized in that** the impact force is applied to the top part of the pipe.

3. Method as claimed in claim 1, **characterized in that** the impact force is applied by a ram block lowered into the pipe.

4. Method as claimed in claim 3, **characterized in that** the impact force is applied to an inner edge in the bottom end of the pipe.

5. Method as claimed in claim 3, **characterized in that** the impact force is applied to concrete poured into the bottom end of the pipe.

6. Method as claimed in claim 1, **characterized in that** the end part is releasably connected to the pipe.

7. Method as claimed in claims 1-6, **characterized in that** the number of strikes amounts to about one hundred.

8. Method as claimed in claims 1-7, **characterized in that** the end part is a lost end part.

9. Pile-driving installation provided with a post (8) for performing the method as claimed in claims 1-8, **characterized by** a sub-frame (9) placed on said post, which supports a rotation motor for rotatably driving a pipe and a ram block for generating an impact force on said pipe, such that the rotation motor or the ram block respectively can be placed as desired above the pipe (1).

10. Pile-driving installation as claimed in claim 9, **characterized in that** the rotation motor and the ram block respectively can each be swivelled round a vertical shaft (10, 11) on said sub-frame (9).

11. Lost end part provided with means suitable for removably connecting said end part to the base end of a hollow cylindrical pipe being adapted to be rotated and impacted into the ground to form a concrete foundation pile, **characterized in that,** said end part comprises a disc like bottom part having a cylindrical wall part intended to closely fit around the base end of the pipe, said bottom part further comprising a tip shaped part (3) with axially extending ribs and a helical part (4) the diameter of which exceeds the outer diameter of said tip part.

Patentansprüche

1. Verfahren zum Anordnen von Betonpfählen im Boden, mit Einbringen eines hohlen zylindrischen Rohres (1) in den Boden, Füllen des Inneren des Rohres mit einer Verstärkung und Betonmörtel und Entfernen des hohlen zylindrischen Rohres aus dem Boden,
wobei das Verfahren gekennzeichnet ist durch
Anordnen eines Endteiles mit einem spitzenförmigen Teil (3) und eines schraubenförmigen Teiles (4) auf dem Bodenende des Rohres, das in den Boden zu treiben ist, drehmäßiges Treiben des Rohres in den Boden und schließlich Anlegen einer Aufschlagskraft auf das Rohr.

2. Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß die Aufschlagskraft auf den oberen Teil des Rohres ausgeübt wird.

3. Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß die Aufschlagskraft durch einen in das Rohr abgesenkten Rammblock ausgeübt wird.

4. Verfahren nach Anspruch 3, dadurch gekennzeichnet, daß die Aufschlagskraft auf eine innere Kante in dem Bodenende des Rohres ausgeübt wird.

5. Verfahren nach Anspruch 3, dadurch gekennzeichnet, daß die Aufschlagskraft auf Beton ausgeübt wird, der in das Bodenende des Rohres gegossen wird.

6. Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß das Endteil lösbar mit dem Rohr verbunden ist.

7. Verfahren nach Ansprüchen 1 bis 6, dadurch ge-

kennzeichnet, daß die Zahl der Schläge sich auf ungefähr 100 beläuft.

8. Verfahren nach Ansprüchen 1 bis 7, dadurch gekennzeichnet, daß das Endteil ein verlorenes Endteil ist.

9. Pfahltreiberanlage, die mit einem Pfeiler (8) zum Ausführen des Verfahrens versehen ist, wie es in Ansprüchen 1 bis 8 beansprucht ist, gekennzeichnet durch einen Hilfsrahmen 9, der auf dem Pfeiler angeordnet ist, der einen Rotationsmotor zum drehbaren Antreiben eines Rohres und einen Rammblock zum Erzeugen einer Aufschlagskraft auf das Rohr trägt, der Art, daß der Rotationsmotor bzw. der Rammblock wie gewünscht über dem Rohr (1) angeordnet werden können.

10. Pfahltreiberanlage nach Anspruch 9, dadurch gekennzeichnet, daß der Rotationsmotor bzw. der Rammblock jeweils um eine vertikale Welle (10, 11) auf dem Hilfsrahmen (9) geschwenkt werden können.

11. Verlorenes Endteil, das mit einem Mittel versehen ist, das geeignet ist zum entfernbaren Verbinden des Endteiles an dem Basisende eines hohlen zylindrischen Rohres, das ausgelegt ist, in den Boden gedreht und geschlagen zu werden zum Bilden eines Betonfundamentpfahles, dadurch gekennzeichnet, daß das Endteil ein scheibenartiges Bodenteil mit einem zylindrischen Wandteil aufweist, das für eine enge Passung um das Basisende des Rohres gedacht ist, wobei das Bodenteil weiter ein spitzenförmiges Teil (3) mit sich axial erstreckenden Rippen und ein schraubenförmiges Teil (4) mit einem Durchmesser, der den äußeren Durchmesser des Spitzenteiles überschreitet, aufweist.

Revendications

1. Procédé d'installation de pieux en béton dans le sol comprenant la mise en place dans le sol d'un tuyau cylindrique creux (1), le remplissage de l'intérieur du tuyau par du mortier de béton et avec une armature et l'enlèvement du tuyau cylindrique creux seul, ledit procédé étant **caractérisé par** une installation d'une partie d'extrémité possédant une partie en forme de pointe (3) et une partie en forme d'hélice (4) sur l'extrémité inférieure du tuyau pour qu'il soit enfoncé dans le sol, l'enfoncement par rotation dans le sol et enfin l'application d'une force impulsive à ce tuyau.

2. Procédé selon la revendication 1, **caractérisé en ce que** la force impulsive est appliquée à la partie supérieure du tuyau.

3. Procédé selon la revendication 1, **caractérisé en ce que** la force impulsive est appliquée par un bloc de compactage descendu dans le tuyau.

4. Procédé selon la revendication 3, **caractérisé en ce que** la force impulsive est appliquée à une bordure intérieure de l'extrémité inférieure du tuyau.

5. Procédé selon la revendication 1, **caractérisé en ce que** la force impulsive est appliquée au béton versé dans l'extrémité inférieure du tuyau.

6. Procédé selon la revendication 1, **caractérisé en ce que** la partie d'extrémité est reliée au tuyau de façon à pouvoir être dégagée.

7. Procédé selon les revendications 1 à 6, **caractérisé en ce que** le nombre de coups s'élève à environ une centaine.

8. Procédé selon les revendications 1 à 7, **caractérisé en ce que** la partie d'extrémité est une partie d'extrémité perdue.

9. Installation d'enfoncement de pieu pourvue d'un montant (8) destiné à mettre en oeuvre le procédé selon les revendications 1 à 8, **caractérisé par** un cadre secondaire (9) mis en place sur ledit montant, lequel supporte un moteur de rotation destiné à enfoncer par rotation un tuyau et un bloc de compactage pour créer une force impulsive sur ledit tuyau, de sorte que le moteur de rotation ou le bloc de compactage peuvent être placés respectivement selon les besoins au-dessus du tuyau (1).

10. Installation d'enfoncement de tuyau selon la revendication 9, **caractérisée en ce que** le moteur de rotation et le bloc de compactage peuvent être respectivement chacun pivotés autour d'un arbre vertical (10, 11) sur ledit cadre secondaire (9).

11. Partie d'extrémité perdue pourvue de moyens appropriés pour relier, de façon à pouvoir l'enlever, ladite partie d'extrémité à l'extrémité de base d'un tuyau cylindrique creux qui est conçu pour être mis en rotation dans le sol pour former un pieu de fondation en béton, **caractérisé en ce que,** ladite partie d'extrémité comprend une partie inférieure en forme de disque possédant une partie cylindrique formant paroi destinée à être montée serrée autour de l'extrémité de base du tuyau, ladite partie inférieure comprenant en outre une partie en forme de pointe (3) avec des nervures s'étendant axialement et une partie hélicoïdale (4) dont le diamètre est supérieur au diamètre extérieur de ladite partie en pointe.

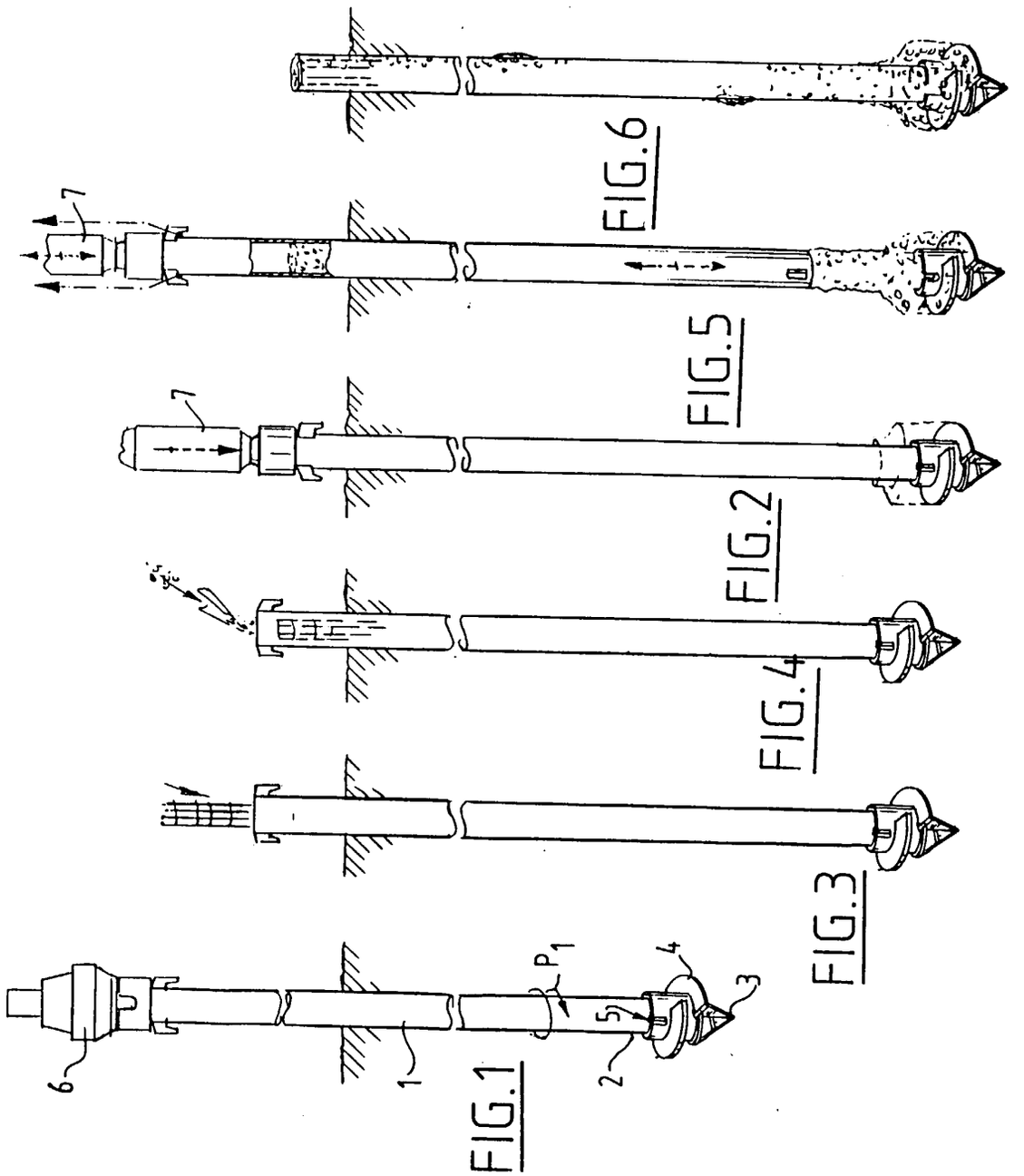

FIG.1

FIG.3

FIG.4

FIG.2

FIG.5

FIG.6

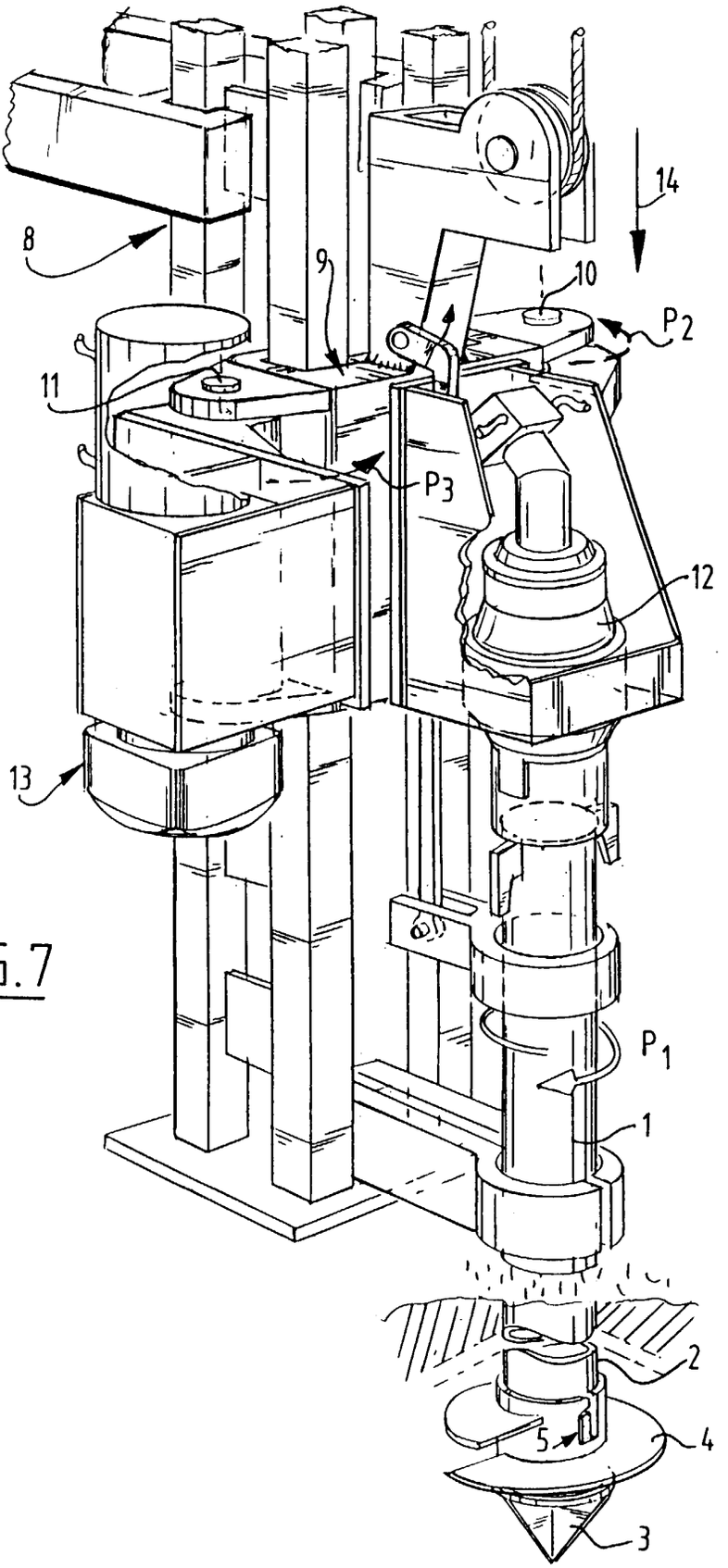

FIG.7

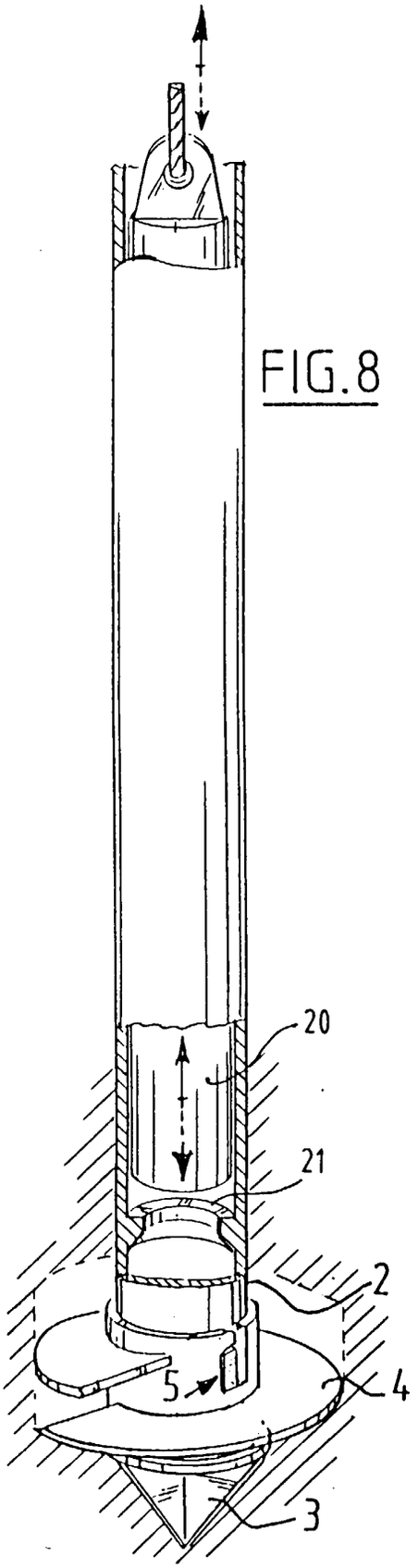

FIG.8

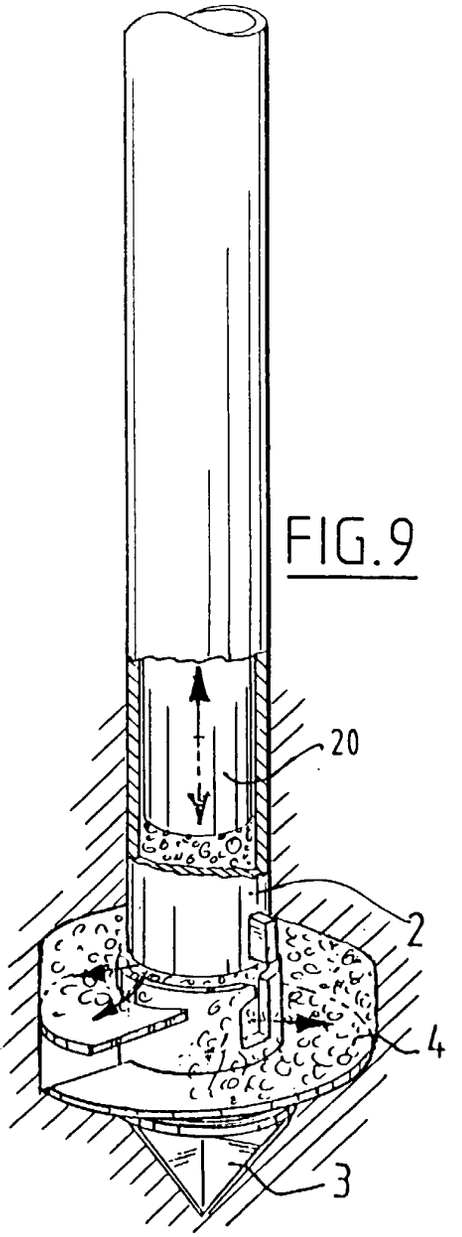

FIG.9