

PATENT SPECIFICATION

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DRAWINGS ATTACHED

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(54) ELONGATE ELEMENT TO BE DRIVEN INTO THE GROUND TOGETHER WITH A SHOE

- (71) We, N.V. TOT AANNEMING VAN
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 Dutch Company, do hereby declare the in-
 5 vention, for which we pray that a patent
 may be granted to us, and the method by
 which it is to be performed, to be par-
 ticularly described in and by the following
 statement:—
 10 The present invention relates to an elon-
 gate element to be driven into the ground
 together with a shoe, and also relates to
 a method of driving an elongate element to-
 gether with a shoe into the ground.
 15 When an elongate element provided with
 a shoe, such as a foundation pile or a tube
 for casting a concrete foundation pile in
 situ, has to be driven into the ground, for
 instance by vibration, it is known to pro-
 20 vide such an element with at least one
 supply pipe, connected with the outer wall
 of the element and extending in the longi-
 tudinal direction of the same. This supply
 pipe terminates near the bottom of the ele-
 25 ment, and is connectable at its top through
 a supply valve to a source of pressurized
 fluid, as for example water under pressure.
 This pressure medium serves to achieve
 a loosening of the ground particles under-
 30 neath the shoe. Furthermore, if the pres-
 surized fluid is a liquid, such as water, the
 liquid ascending around the element will
 carry away the ground particles, whereby
 space is obtained for the volume occupied
 35 by the element. However, since the pres-
 surized fluid flows away in this case, it must
 be supplied in large quantities in order
 that the element may be driven further into
 the ground. In addition, the use of a pres-
 40 surized fluid involves a considerable pollu-
 tion of the building site by the liquid dis-
 charged along the element, and in particular
 by the deposition of the ground particles
 carried along with this liquid.
 45 Moreover, with the known elements, it

is not possible to interrupt the supply of
 the pressurized fluid periodically during the
 driving process, because the ground would
 penetrate into the supply pipes during such
 interruptions, whereby the pipes would be
 50 clogged and a further supply of the pres-
 surized fluid would be rendered impossible.
 On the other hand, the ground structure is
 frequently of such a nature that it is not
 only unnecessary, but even harmful to sup-
 55 ply the pressurized fluid during the entire
 driving stretch, because in soft ground layers,
 and especially in clay and sludge layers,
 the supply of a pressurized fluid has the
 disadvantage that too much ground is car-
 60 ried away, and that the ground surrounding
 the element is heavily disturbed, so that the
 element is no longer entirely enclosed by
 the ground.

It is an object of the present invention 65
 to provide an element of the above-men-
 tioned kind whereby the said disadvantages
 are alleviated.

The invention consists in an elongate
 element, such as a foundation pile or a
 70 tube for casting a concrete foundation pile
in situ, adapted to be driven into the ground,
 as for example by vibration, together with
 a shoe at its lower end, and comprising
 at least one supply pipe, the or each pipe 75
 being disposed on the outer wall of the
 element, extending in the longitudinal direc-
 tion of the latter, terminating near the lower
 end of the element, and connectable at its
 upper end through a supply valve, to a
 80 source of pressurized fluid, preferably water
 under pressure, wherein the or each supply
 pipe is provided at its lower end with means
 for preventing penetration of ground into
 the or each supply pipe when the supply 85
 valve is closed, but allowing discharge of
 the pressurized fluid from the supply pipe
 when the supply valve is open.

The invention also consists in a method
 of driving an elongate element, as herein- 90

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above described, into the ground, as for example by vibration, wherein the supply of the pressurised fluid to the supply pipes is periodically interrupted.

- 5 In a preferred embodiment of the method according to the invention, the supply valve is closed at least during the initial stage. Since no pressurised fluid is supplied during the initial period of the driving process, the element remains in close contact with the surrounding. A leakage of the pressurised fluid supplied during the remaining portion of the driving process is effectively prevented in this manner, so that the quantity of the pressurised fluid introduced into the ground is accurately defined, and the required loosening of the ground underneath the shoe may be obtained with a minimum consumption of the pressurised fluid. If the pressurised fluid is a liquid, the pollution of the building site is also effectively reduced.

The invention will now be described by way of example only, with reference to the accompanying drawings, wherein:—

- 25 Figure 1 shows a partial longitudinal section of an element according to the invention.

Figure 2 shows a top view of a shoe of the element as shown in Figure 1, wherein three supply pipes have been schematically indicated.

- 30 Figure 3 shows a longitudinal section of the lower end of a modification of the supply pipe.

Figure 1 shows a portion of a tube 1 which is adapted to be driven into the ground, as for example by vibration, together with a loose shoe 2. The tube 1 serves as a mould for the casting in situ of a concrete foundation pile, and is afterwards removed.

- 40 The tube 1 is provided on its outside with a plurality of supply pipes 3 for a pressurized fluid, preferably water under pressure; these supply pipes are spaced at substantially equal distances along the periphery of tube 1. Three supply pipes are preferred, only one being shown in Figure 1. The supply pipes 3 are attached, for instance by welding, to the outer wall of tube 1. As appears from Figure 1, the lower ends of the supply pipes 3 may be offset to the outside. At their tops, the supply pipes 3 are connected, through a supply valve, to a source of the pressurized fluid, preferably water under pressure.

At its lower end, each of the supply pipes 3 carries an outlet nozzle 4, screwed into a nipple 5; the nipple 5 is screwed into the lower end of the supply pipe. The outlet nozzle 4 comprises an outlet channel 6 with a reduced diameter, of which the lower part 7 terminates immediately underneath the loose shoe 2, and is downwardly inclined toward the axis of tube 1.

- 65 A non-return valve 8 is arranged above

the outlet nozzle 4. The valve 8 comprises a spring 9 supported by the outlet nozzle 4, and exerting an upward force, through the intermediary of a pressure member 10 on a spherical valve body 11, whereby the latter is pressed toward a valve seat 12 provided in the top face of nipple 5.

When the supply valve at the top of the supply pipe 3 is open, the valve body 11 is lowered by the pressure of the fluid, which may amount to 10 atm, so that the pressurized fluid is discharged through the outlet nozzle 4. As soon as the supply of the pressurized fluid is interrupted, the non-return valve 8 is immediately closed, so that a penetration of ground into the supply pipe is substantially completely prevented.

As appears from Figure 2, the peripheral edge of the loose shoe 2 is provided with recesses 13 partially encircling the outlet nozzles 4.

Figure 3 shows a modification of the supply pipe 3. A sleeve 14, made of a porous material, such as sintered bronze, lies against a shoulder 15 formed in the supply pipe 3, and is retained by a plug 16 screwed into the lower end of the supply pipe. The interior of the sleeve 14 is in open communication with the interior of the supply pipe 3. Outside the sleeve 14, an outlet channel 17 has been formed in the wall of the supply pipe 3. The channel 17 terminates immediately underneath the loose shoe 2, and is downwardly inclined toward the axis of tube 1.

The porous sleeve 14 passes the pressurized fluid, but prevents the ground from penetrating into the supply pipe.

The invention makes it possible to interrupt the supply of the pressurized fluid periodically during the driving process without any danger of a clogging of the supply pipes by the ground.

Preferably, the supply of the pressurized fluid is interrupted during the initial stage of the driving process, so that the tube 1 remains in close contact with the surrounding ground, and any leakage of the pressurized fluid during the remaining portion of the driving process is effectively prevented.

Furthermore, the supply of the pressurized fluid may be stopped immediately before the required depth is reached, so that the ground underneath the shoe 2 in its ultimate position is sufficiently densified, which is necessary for adequate load bearing of the final foundation pile.

The invention is not restricted to the embodiments shown in the drawings, which may be modified in various ways within the scope of the invention. For instance, the invention may also be applied to a prefabricated foundation pile.



(11)

WHAT WE CLAIM IS:—

1. An elongate element, such as a foundation pile or a tube for casting a concrete foundation pile in situ, adapted to be driven into the ground, as for example by vibration, together with a shoe at its lower end, and comprising at least one supply pipe, the or each pipe being disposed on the outer wall of the element, extending in the longitudinal direction of the latter, terminating near the lower end of the element, and connectable at its upper end, through a supply valve, to a source of a pressurized fluid, preferably water under pressure, wherein the or each supply pipe is provided at its lower end with means for preventing penetration of ground into the or each supply pipe when the supply valve is closed, but allowing discharge of the pressurized fluid from the supply pipe when the supply valve is open.

2. An element as claimed in Claim 1, wherein the or each supply pipe is provided at its lower end with a valve constituting said means for preventing penetration of ground.

3. An element as claimed in Claim 2, wherein the latter valve is a non-return valve and comprises a spring exerting an upward force on a movable valve body, whereby the latter is pressed toward a valve seat.

4. An element as claimed in Claim 2 or 3, wherein the valve body is spherical.

5. An element as claimed in any one of the preceding Claims, wherein the or each supply pipe carries an outlet nozzle, which comprises an outlet channel terminat-

ing immediately underneath the shoe and downwardly inclined toward the longitudinal axis of the element.

6. An element as claimed in Claim 1, wherein the said means comprise a sleeve made of a porous material, such as sintered bronze, and arranged in the lower end of the supply pipe so that the interior of the sleeve communicates with the interior of the supply pipe, an outlet channel being provided in the supply pipe adjacent the outer side of the sleeve.

7. An element as claimed in Claim 6, wherein the outlet channel terminates immediately underneath the shoe, and is downwardly inclined toward the longitudinal axis of the element.

8. A method of driving an elongate element as claimed in any one of Claims 1 to 7 into the ground, as for example by vibration, wherein the supply of the pressurized fluid to the supply pipes is periodically interrupted.

9. A method as claimed in Claim 8, wherein the supply of the pressurized fluid is interrupted at least during the initial stage of the process.

10. An elongate element, which is a tube for casting a concrete foundation pile in situ, substantially as described and illustrated in the accompanying drawing.

11. A method of driving an elongate element into the ground substantially as described and illustrated in the accompanying drawing.

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