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(54) **A method for inserting a drainage wick**

(57) The invention relates to a device for placing at least one elongate element, such as a drainage wick, in a ground, comprising:

- a frame displaceable over the ground and having thereon a mast which is upright at least during use;
- a lance which is movable reciprocally with a drive relative to the mast forming a guide therefor, and which comprises in the longitudinal direction thereof a passage for receiving therein the elongate element at least during a downward movement of the lance, and for feed there through of the elongate element during an upward movement of the lance; and
- engaging means in the passage close to lower end of the lance during use which co-displace an element for placing in the downward movement of the lance.

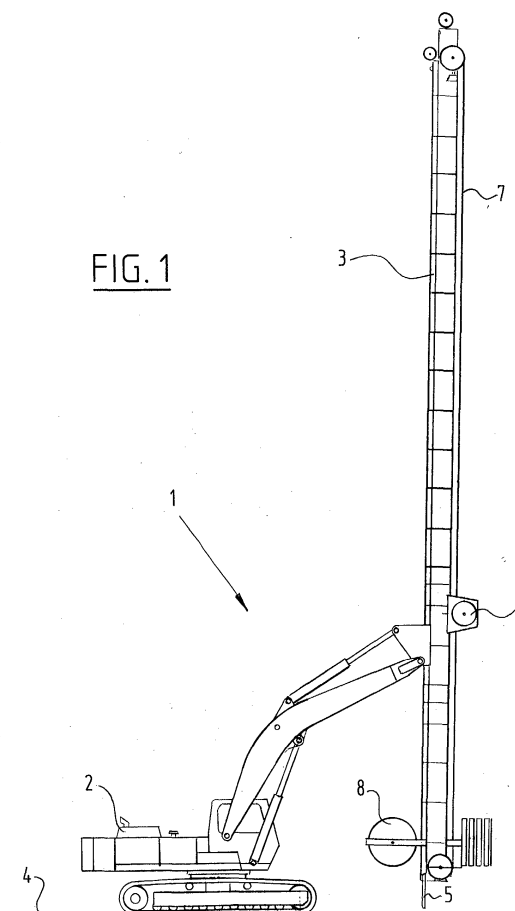


FIG. 1

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Description

[0001] The present invention relates to a device for placing at least one elongate element, such as a drainage wick, in a ground, comprising:

- a frame displaceable over the ground and having thereon a mast which is upright at least during use;
- a lance which is movable reciprocally with a drive relative to the mast forming a guide therefor, and which comprises in the longitudinal direction thereof a passage for receiving therein the elongate element at least during a downward movement of the lance, and for feed there through of the elongate element during an upward movement of the lance.

[0002] Such a device is generally known, for instance from the European patent application EP-A-0 672 795.

[0003] Such devices are commonly, though not exclusively used to place drainage wicks as elongate elements vertically in the ground.

[0004] In such devices for inserting for instance drainage wicks it is usual for an operative to walk along with the device. This operative arranges a ground anchor on the drainage wick before the drainage wick is placed in the ground. The ground anchor forms a closure for the open end of the lance when the lance is forced along the mast into the ground. After the furthest depth has been reached, the lance is brought back up again, wherein the ground anchor ensures that the drainage wick remains behind and is pulled through the passage in the lance. When the lance is lifted out of the ground again, wherein the drainage wick has been left behind in the ground as a result of the action of the ground anchor, which is usually designed as an element in the form of a steel plate, the operative manually severs the wick. The device is then once again available to place a following drainage wick. The wick is usually unrolled from a spool or reel so that the above described operations can be repeated for each drainage wick to be inserted until a spool or reel has to be replaced.

[0005] The above described technique has a number of drawbacks.

[0006] The elements in the form of a steel plate, which serve as ground anchors and to close and protect the open underside of the lance when the lance is forced into the ground, remain behind in the ground without these elements in the form of a steel plate playing any actual part in the function of the drainage wick. The elements in the form of a steel plate are not particularly expensive per se. However, when drainage wicks are placed this usually takes place in large numbers. Large numbers of these elements in the form of a steel plate are therefore also used, whereby the cost of using such a known device is not quite so negligible. The arrangement of the elements in the form of a steel plate on the free end of the drainage wicks to be inserted is moreover very tedious and still onerous work for the operative,

who must walk along with the device for this purpose. In view of the large number of elongate elements (drainage wicks) for placing, said operative must also sever the wicks often. In view of the frequency with which this must be done, this operative will not often feel inclined to cut the wick very close to the ground, but rather at waist height so as not to have to bend. The use of drainage wick material is therefore also considerable. The presence, in addition to the operator of the device, of the operative for arranging the ground anchors and severing the wicks is a further cost factor.

[0007] The present invention has for its object to alleviate the above stated problems of the known art, and in some embodiments even obviate them completely. A device according to the present invention is distinguished for this purpose by two measures, which can be taken together or individually, namely: engaging means in the passage close to the lower end of the lance during use which co-displace an element for placing in the downward movement of the lance, and/or sticking means which, in or close to the lowest position of the lance, carry the element out of the lance and stick it in the ground prior to or at the start of the upward movement of the lance.

[0008] As component of the lance, the engaging means fulfil a co-displacing function for carrying along the drainage wick, for which purpose the ground anchor was used in the known art, and which is therefore no longer necessary. The sticking means ensure that a wick becomes fixed in the ground in or close to the deepest point of the inserting lance, for which purpose the ground anchor has in the past been used in the known art, and which is therefore no longer necessary to fulfil this function. Particularly in an embodiment with engaging means and sticking means in or close to the lower end of the lance during use, the need for a ground anchor in the form of a steel plate disappears completely.

[0009] In a very favourable embodiment the sticking means and the engaging means can be designed as a unit. This enhances the simplicity of the device and is favourable for the number of components in or close to the lower end of the lance. Such a unit can comprise a pull rod extending in the passage in the longitudinal direction of the lance and a spring element arranged thereon close to the lower end of the lance during use, wherein the unit is arranged movably in the passage. During the downward movement the spring element holds the drainage wick fast by clamping against the inner wall of the lance, and thus fulfils the function of engaging means. The pull rod is movable in the lance. When the deepest point is reached, first the lance and only later the pull rod are carried upward. The spring element is here wholly or partially released from the interior of the lance and therefore then fulfils the function of the sticking means, whereby the wick is stuck into the ground surrounding the pull rod.

[0010] In a favourable embodiment the lance can comprise a closing part on the lower end during use for

the purpose of closing the passage at least during a downward movement of the lance. This closing part can form part of said pull rod, or be a separate component on the lance itself. As is achieved in the known art with the ground anchor, such a closing part prevents the interior of the lance being blocked with earth. In one embodiment wherein the closing part is arranged on the unit, or more specifically on the pull rod, this closing part can be a spherical head. Such a spherical head will of course have larger dimensions than the opening on the underside of the lance to enable effective closing thereof during said downward movement.

[0011] Alternatively however, the closing part can be a valve on the lower end of the lance during use. This is a particularly favourable embodiment for loose soil compositions which, when the lance is moved upward, collapse on and around a spherical head arranged for instance on the end of the pull rod, which can prevent the drainage wick being left behind in the ground in the desired manner. The spherical head is well suitable for a firmer ground, wherein the closing part, when it forms part of the pull rod in particular and the unit in general, is not precluded from having a form other than a spherical head. It is for instance possible to envisage a conical head etc. In one embodiment with a valve on the lower end of the lance during use, such a valve can be a flap of tough, strong and flexible material, such as rubber with a strengthening reinforcement. It is possible for instance to envisage rubber strengthened with steel wire such as is for instance applied for car tyres.

[0012] In yet another embodiment the lance can itself comprise cutting means for the purpose of severing the elongate element after an upward movement of the lance, once it has been brought back above ground. In a favourable embodiment use is herein made of the horizontal displacement of the device to a new location where another drainage wick must be placed in the ground. The cutting means can simply be designed here as a stationary knife positioned in accordance with the direction of displacement.

[0013] The invention will be further described hereinbelow with reference to the annexed drawings which show embodiments of the invention and in which the same reference numerals are used for the same or similar components, and wherein:

Fig. 1 shows a schematic side view of a device according to the present invention;

Fig. 2 shows a detail of the inserting lance of a device in a first embodiment according to the present invention;

Fig. 3 shows a detail of an inserting lance of a device in a second embodiment according to the present invention;

Fig. 4 shows a detail of the top side during use of a

mast of a device in another embodiment of the invention; and

Fig. 5 shows a detail of the inserting lance shown in fig. 4 as alternative to the configuration shown in fig. 3.

[0014] Fig. 1 shows a device 1 according to the present invention. This comprises a frame in the form of a crane 2 which can travel over the ground 4 in which drainage wicks must be placed. On crane 2 is arranged a mast 3 along which an inserting lance 5 can be moved. Mast 3 thus forms a guide for inserting lance 5. Arranged on mast 3 is a drive motor 6 which forms a drive for inserting lance 5 to move it reciprocally along guide 3. Inserting lance 5 and motor 6 are mutually connected via a tensioned cable 7.

[0015] In the arrangement shown in fig. 1 the device 1 is ready for use. When motor 6 is set into operation the inserting lance 5 is forced into the ground 4. When the furthest depth has been reached, which is preferably adjustable, the inserting lance is moved upward again while leaving behind a drainage wick which is unrolled from a spool 8 during the downward movement of inserting lance 5. When the inserting lance has been brought back again above the surface of ground 4, the drainage wick left behind in the ground is severed and the crane 2 is driven to a subsequent location where a drainage wick has to be inserted.

[0016] Fig. 2 shows a cut-away schematic view of an inserting lance 5 in a first embodiment according to the present invention. Inserting lance 5 is hollow and has a passage 10. Extending in passage 10 is a pull rod 11 having on the end thereof a spherical head 12 closing the passage 10. Further arranged on pull rod 11 is a leaf spring 13 which forms the engaging means in the sense of the present invention.

[0017] In addition to pull rod 11, a drainage wick 9 also extends through passage 10. Drainage wick 9 is pressed by leaf spring 13 against the inner wall of lance 5 and thus co-displaced when the inserting lance 5 is forced into the ground.

[0018] Once inserting lance 5 has reached the deepest point, pull rod 11 is temporarily held stationary while a start is already made with pulling the inserting lance 5 back up. The spherical head 12 is herein released from the opening of passage 10 on the underside of the inserting lance. The inserting lance 5 is pulled so far up that leaf spring 13 is moved clear of the passage. Leaf spring 13 herein presses the drainage wick 9 into the surrounding ground so as to thus fix and position drainage wick 9. The inserting lance 5 is then moved upward together with pull rod 11. Drainage wick 9 herein slides through the interior of the passage 10 and remains behind while inserting lance 5 is moved upward while therefore leaving drainage wick 9 in the ground.

[0019] As soon as the inserting lance 5 has arrived

above the ground surface, for instance only a few centimetres there above, the spherical head 12 is once again pulled against the opening of passage 10. A horizontal displacement of the device shown in fig. 1 subsequently takes place to a new location where a drainage wick 9 must also be placed in the ground. During this displacement the drainage wick 9 is severed with a knife 14, wherein the spherical head 12 presses drainage wick 9 against the knife. Displacement of device 1 is then preferably in the direction of arrow A in order to realize the most efficient possible action of knife 14.

[0020] It is noted that further measures can be taken to make more certain that drainage wick 9 is left behind. Protrusions 15 can thus be arranged in the interior of inserting lance 5 between which the drainage wick 9 can unwind freely. During the upward movement of inserting lance 5 out of the ground the leaf spring 13 can then rest on these protrusions 15. This is brought about by carrying the inserting lance, with the pull rod 11 therein and the spherical head 12 on the opening of passage 10, to the deepest point. The inserting lance is then moved upward until leaf spring 13 is moved clear of the interior of passage 10 to stick the drainage wick in the surrounding ground. Pull rod 11 is then moved upward again relative to inserting lance 5 until the leaf spring once again rests on said protrusions 15 in the interior of passage 10. During this pulling-up movement of pull rod 11 relative to inserting lance 5 this latter can be held stationary for a moment or the upward movement thereof can be continued.

[0021] Fig. 3 shows an embodiment as a possible alternative to the embodiment of fig. 2. This relates particularly to an alternative for the spherical head 12 of fig. 2. In the embodiment of fig. 3 the pull rod has constant dimensions along the whole length thereof, which is advantageous when the inserting lance 16 is used in looser soil which collapses onto the pull rod when inserting lance 16 is moved upward to release the leaf spring 13. In the configuration of fig. 2 the collapse of soil onto the spherical head 12 can result in the drainage wick 9 adhering to the spherical head 12 and/or pull rod 11. This is obviated, to a considerable extent if not entirely, in the configuration of fig. 3, although in such a configuration alternative measures do however have to be taken for the spherical head so as to prevent passage 10 becoming blocked with earth. A flap 18 is placed for this purpose over the opening of passage 10 on the underside of inserting lance 16. This flap closes the opening during a downward movement of inserting lance 16. When the inserting lance is moved upward again while pull rod 11 remains temporarily stationary, the pull rod 11 pushes the flap 18 aside, where after leaf spring 13 is released in order to stick the drainage wick 9 (not shown in fig. 3) in the ground.

[0022] It is noted that flap 18 is manufactured from rubber reinforced with steel wire. Such rubber reinforced with steel wire is comparable to the way in which a car tyre is designed. A steel wire reinforcement is very de-

sirable to be able to withstand the high forces generated when the inserting lance is forced into the ground.

[0023] It is noted that, in addition to the spherical head 12 or flap 18, many other random solutions are also possible within the scope of the present invention for the purpose of closing the opening of passage 10 on the underside of the inserting lance during the downward movement thereof. A steel hinged valve could thus be used, provided measures are taken to protect a hinge thereof from the action of sand and earth. It is in any case important that the passage 10 of the inserting lance does not become blocked, for which purpose some form of closing part is necessary, the spherical head 12, flap 18, a valve (not shown) only being examples thereof.

[0024] In fig. 3 use is further made of a slide block 17 in the interior of inserting lance 16. The pull rod slides over this slide block 17 during a movement of pull rod 11 and inserting lance 16 relative to each other, thus also enhancing the action of the leaf spring in co-displacing the drainage wick and sticking thereof in the surrounding ground. Without such a slide block the pull rod 11 is pressed sideways by leaf spring 13, to the left in the drawing, which could affect effective operation thereof. Slide block 17 effectively prevents this.

[0025] Fig. 3 further shows that a stop 18 is arranged on pull rod 11 and a stop 19 is arranged on the interior of inserting lance 16. The distance between these stops 18, 19 corresponds to the distance which the inserting lance 16 covers on the way up again after reaching the furthest insertion distance into the ground, before the pull rod begins to co-displace upward again. At this moment the stops 18, 19 come into mutual contact and pull rod 11 is carried upward with the inserting lance. At least one of the stops 18, 19 can preferably be positioned adjustably so that the above mentioned distance is adjustable.

[0026] In the configuration shown in fig. 4 the pull rod 11 extends through the whole inserting lance 5, even to a point beyond the upper end during use of inserting lance 5. In the position of pull rod 11 relative to inserting lance 5 in which it protrudes under inserting lance 5 during (at least the start of) the upward movement of the inserting lance, as described above, the upper end of pull rod 11 also protrudes above the upper end of inserting lance 5.

[0027] As shown in fig. 5, pull rod 11 comprises on the top side thereof a slotted hole 21 in which is placed a slide block 22. Slotted hole 21 has a limited length and, because slide block 22 is mounted fixedly on inserting lance 5, the freedom of movement of pull rod 11 relative to inserting lance 5 is bounded thereby.

[0028] The part 20 of pull rod 11 above slotted hole 21 protrudes above the upper end of inserting lance 5 because slide block 22 is arranged close to the upper end of inserting lance 5. The part 20 of pull rod 11 is therefore available to be engaged in or close to the upper position of inserting lance 5 relative to mast 3.

[0029] By engaging said upper part 20 of pull rod 11

when the inserting lance 5 is back again or moves into or close to the upper position thereof relative to mast 3, the pull rod 11 can be moved upward again relative to the inserting lance to the starting position thereof shown in for instance fig. 2 or fig. 3, where after the construction can once again be used for a new operation.

[0030] In fig. 4 the engagement and pulling up of pull rod 11 is realized with two pairs of tyres 23 on the top side of mast 3 which are selectively rotatable. The tyres 23 of each pair are rotatable in opposite orientation as indicated with arrows A and A'. When inserting lance 5 is in or returns to the upper position again relative to mast 3, with the pull rod 11 in the lower position relative to inserting lance 5, wherein the upper edge of slotted hole 21 lies against slide block 22, the part 20 of pull rod 11 still protrudes so far above the top of inserting lance 5 that the lower pair of tyres 23 engage this part 20 of pull rod 11 between said pair of tyres 23. Through selective driving of tyres 23 which, as stated, are rotatable in opposite orientation, pull rod 11 is now pulled upward relative to the then (almost) stationary inserting lance 5.

[0031] As alternative to such a configuration, use can for instance be made of a winch (not shown) or the like, wherein pull rod 11 can be pulled up on a cable. However, the advantage of the embodiment of the invention shown in fig. 4 and 5 is that pull rod 11 remains behind in the deepest position under the influence of its own weight when inserting lance 5 begins to move upward again after reaching that deepest point. This is the case because pull rod 11 extends through the whole inserting lance 5, although it is not inconceivable that weighting must be arranged on the inserting lance for this purpose.

[0032] When inserting lance 5 is moved upward through a distance defined by the length of slotted hole 21, pull rod 11 is carried along by slide block 22 to the range of engagement of tyres 23. Close to or at the highest point of inserting lance 5 relative to mast 3 the pull rod 11 enters the range of engagement of tyres 23 and is lifted relative to inserting lance 5.

[0033] It may occur that inserting lance 5 does not reach the intended depth. An obstacle such as a stone may for instance be encountered while the inserting lance is being forced downward. If this happens, the inserting lance has to be moved back up again. In a configuration wherein pull rod 11 is suspended with a cable from a winch, the operation of this winch can be controlled by a control. It is not possible here to take account of the intended depth not being reached. In such a configuration the whole operation is therefore aborted, while in the configuration shown in fig. 4 and 5 a drainage wick can still be placed to the depth reached, even if this is less deep than the intended depth.

[0034] Tyres 23 thus form a lifting mechanism for pull rod 11 which only acts on pull rod 11 in or close to the highest position of inserting lance 5 during use. This does not however preclude use being made of a lifting device which is continuously in contact with the pull rod so as to realize the function described above for in-

stance with reference to fig. 2, wherein in or close to the lowest point of inserting lance 5 the pull rod 11 is also lifted some distance to cause leaf spring 13 to rest on protrusions 15.

[0035] After examination of the foregoing it will be apparent to a skilled person that many additional and alternative embodiments are possible within the scope of the present invention as defined in the appended claims. Some attention has thus already been paid in the foregoing to alternative designs of a closing part required to prevent blockage of the passage. It is also possible to envisage other embodiments of the engaging means, which are described in the foregoing as a leaf spring, and of the sticking means, which also take the form of a leaf spring. Instead of the leaf spring explicitly described above, use can also be made as engaging means of a clamp selectively fixable with a spiral spring, although for the clamp a control connection through the passage to the clamp is then necessary. The sticking means and the engaging means do not necessarily have to form a unit, although this is advantageous in respect of the number of components in the lower end of the inserting lance during use.

Claims

1. Device for placing at least one elongate element, such as a drainage wick, in a ground, comprising:

- a frame displaceable over the ground and having thereon a mast which is upright at least during use;
- a lance which is movable reciprocally with a drive relative to the mast forming a guide therefor, and which comprises in the longitudinal direction thereof a passage for receiving therein the elongate element at least during a downward movement of the lance, and for feed there through of the elongate element during an upward movement of the lance; and
- engaging means in the passage close to the lower end of the lance during use which co-displace an element for placing in the downward movement of the lance.

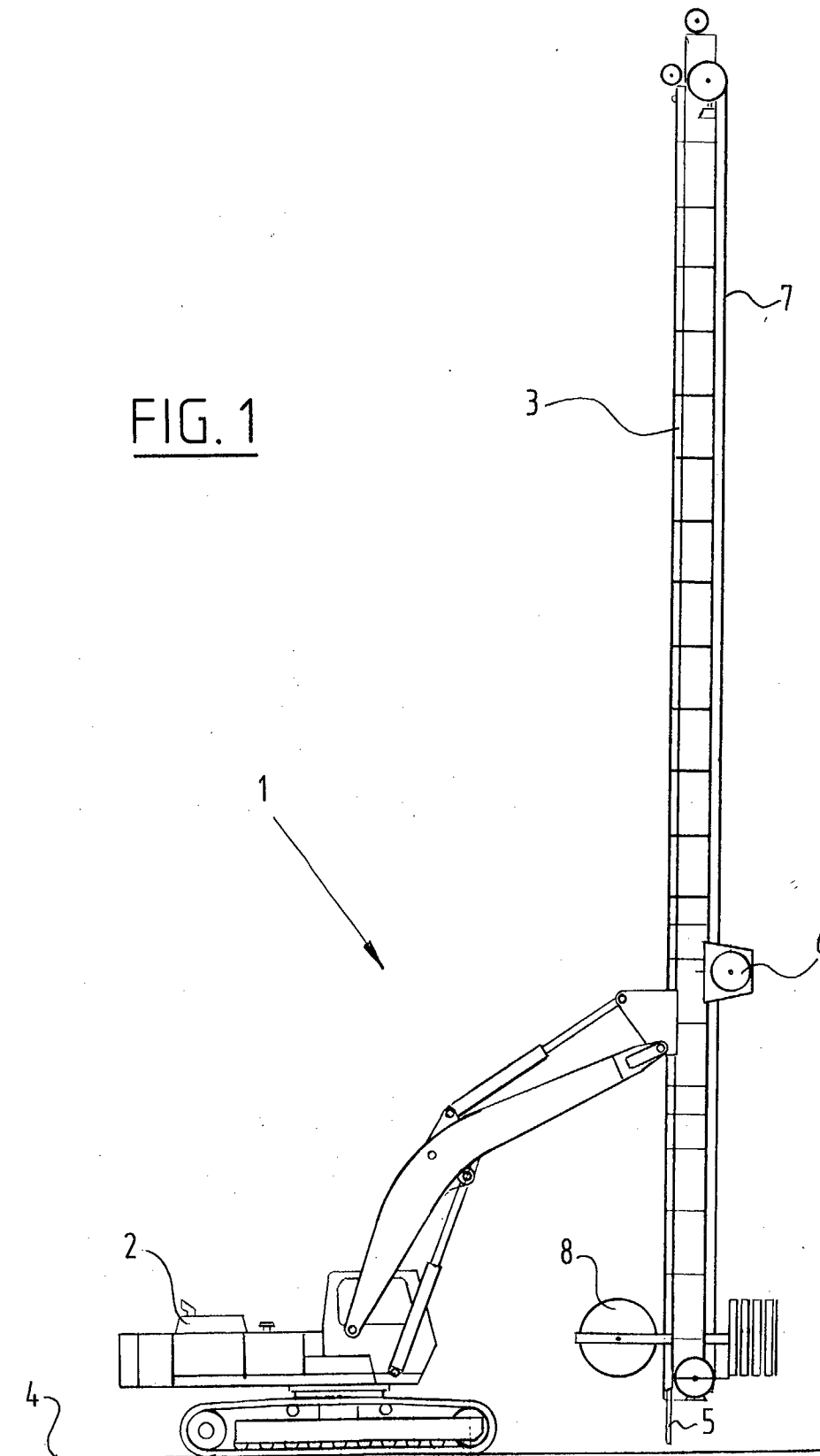
2. Device for placing at least one elongate element, such as drainage wicks, in a ground, comprising:

- a frame displaceable over the ground and having thereon a mast which is upright at least during use;
- a lance which is movable reciprocally with a drive relative to the mast forming a guide therefor, and which comprises in the longitudinal direction thereof a passage for receiving therein the elongate element at least during a downward movement of the lance, and for feed there

- through of the elongate element during an upward movement of the lance; and
- sticking means which, in or close to the lowest position of the lance, carry the element out of the lance and stick it in the ground surrounding the lance prior to or after the start of the upward movement of the lance. 5
3. Device as claimed in claims 1 and 2, wherein the sticking means and the engaging means form a unit. 10
 4. Device as claimed in claim 3, wherein the unit comprises a pull rod extending in the passage in the longitudinal direction of the lance and a spring element arranged thereon close to the lower end of the lance during use, which unit is arranged movably in the passage. 15
 5. Device as claimed in claim 4, wherein the pull rod is longer than the inserting lance and comprises a part which during use protrudes at all times above the inserting lance, and wherein a lifting mechanism for the pull rod is arranged on the mast on the upper side thereof during use and acts on the pull rod at least in or close to a highest position of the inserting lance. 20 25
 6. Device as claimed in claim 1 or 2, wherein the lance comprises a closing part on the lower end during use for the purpose of closing the passage at least during a downward movement of the lance. 30
 7. Device as claimed in claim 3 or 4 or 5 and 6, wherein the closing part is arranged on the unit. 35
 8. Device as claimed in claims 4 and 7, wherein the closing part comprises a spherical head on the lower end of the pull rod during use. 40
 9. Device as claimed in claim 6, wherein the closing part comprises a valve on the lower end of the lance during use.
 10. Device as claimed in claim 9, wherein the valve comprises a flap of tough, strong and flexible material, such as rubber with a strengthening reinforcement. 45
 11. Device as claimed in any of the foregoing claims, wherein the elongate element is longer than the lance and can be severed, and the lance comprises cutting means on the lower end during use with which the elongate element can be severed after an upward movement of the lance. 50 55
 12. Device as claimed in any of the claims 6-10 and 11, wherein the cutting means are arranged in station-

ary manner close to the lower end of the lance during use and co-act with the closing part to sever the elongate element, wherein the closing part brings the element into active contact with the cutting means upon completion of the upward movement of the lance with which the lance is withdrawn from the ground.

FIG. 1



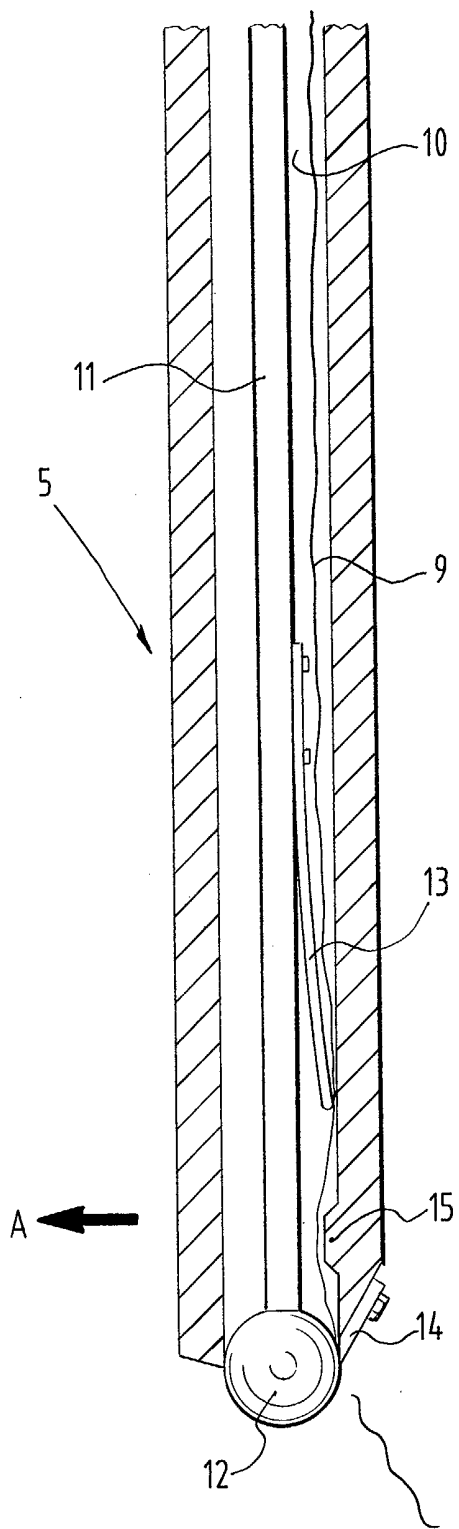


FIG. 2

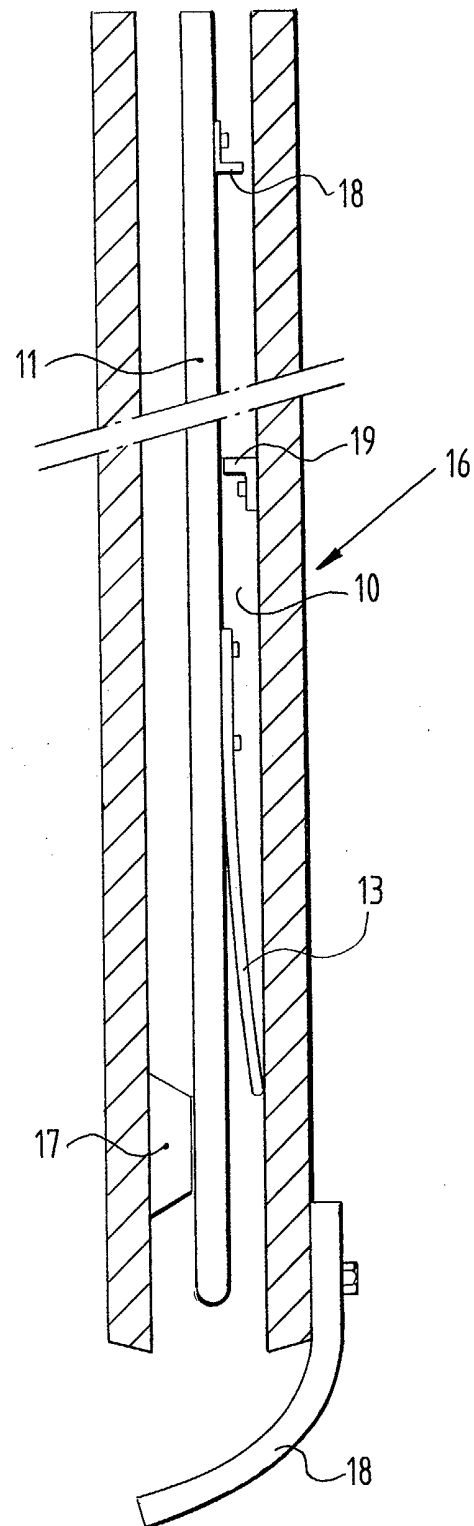


FIG. 3

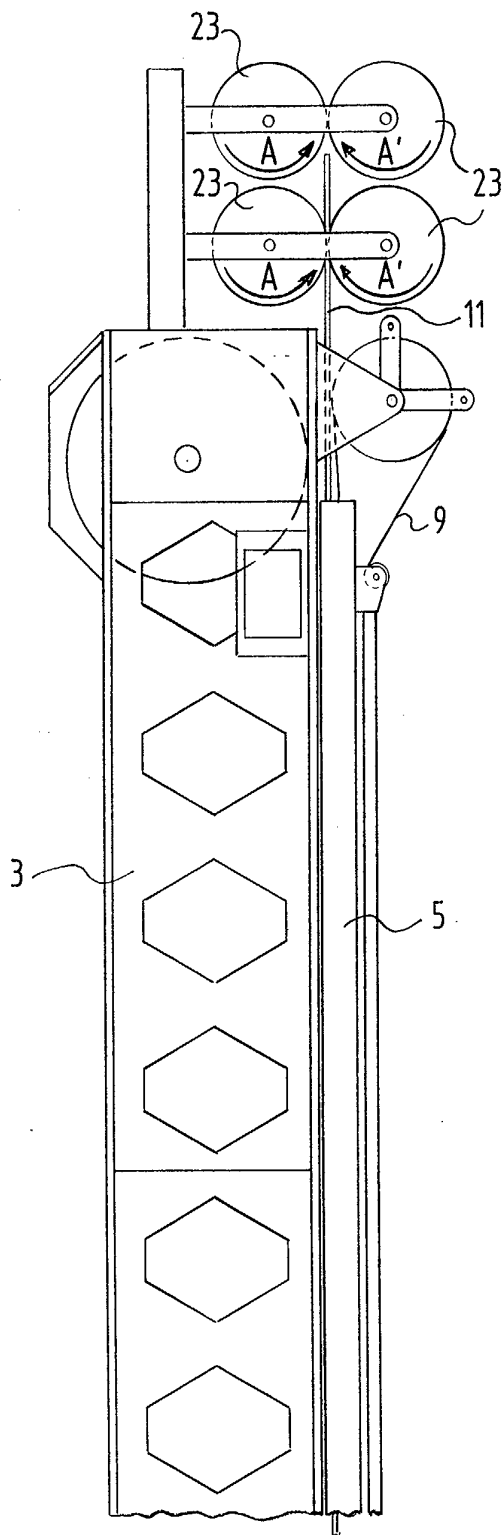


FIG. 4

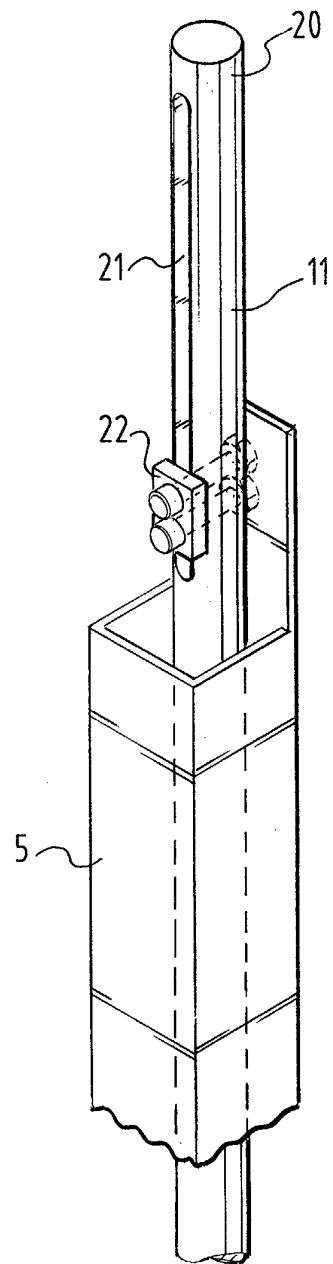


FIG. 5



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EUROPEAN SEARCH REPORT

Application Number
EP 02 08 0342

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)
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			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			E02D E02B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 18 March 2003	Examiner Movadat, R
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EP 02 08 0342

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18-03-2003

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