(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 494 097 A1**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **92200019.5**

(51) Int. Cl.5: **E02D 19/18**

(22) Date of filing: **03.01.92**

(30) Priority: **04.01.91 NL 9100011**

(43) Date of publication of application:
08.07.92 Bulletin 92/28

(84) Designated Contracting States:
BE DE DK FR GB LU NL

(71) Applicant: **HOLLANDSCHE BETON GROEP N.V.**
489, Generaal Spoorlaan
NL-2285 TA Rijswijk(NL)

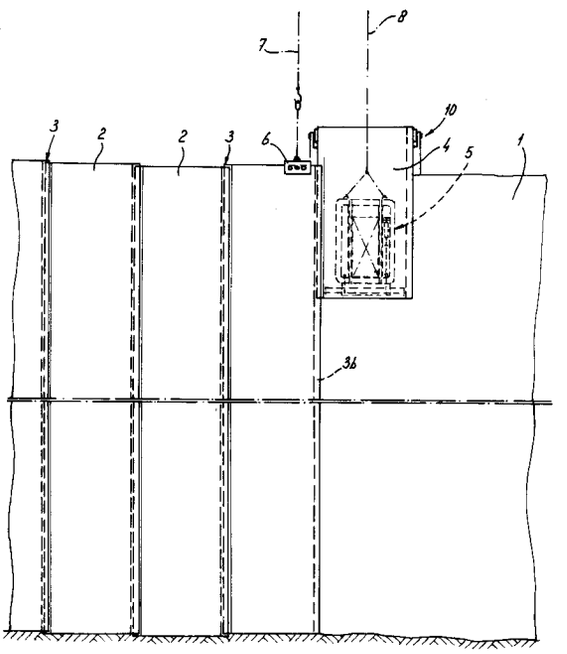
(72) Inventor: **Broeders, Peterus Jacques**
Wede 5
NL-4761 XP Zevenbergen(NL)
Inventor: **De Rouw, Hendrik**
Mgr. Nolenslaan 702
NL-3119 ET Schiedam(NL)
Inventor: **De Zeeuw, Leo**
Wethouder Venteweg 124
NL-2805 JS Gouda(NL)

(74) Representative: **de Bruijn, Leendert C.**
Nederlandsch Octrooibureau
Scheveningseweg 82 P.O. Box 29720
NL-2502 LS 's-Gravenhage(NL)

(54) Device for inserting a screen into the ground, and method for using such a device.

(57) A device for inserting an essentially vertical screen into a trench dug in the ground and filled with a mixture such as a bentonite-water mixture or a bentonite-cement-water mixture, which screen is composed of sheeting panels (2) which are interconnected by means of lock parts provided at their vertical side edges, has an insertion element (5) with a width corresponding approximately to the width of a panel, and has means by which it can be connected to the edge of each panel to be placed in the bottom of the trench, in such a way that the panel (2) concerned can be pulled into the trench under the influence of the weight of the insertion element. The height of the insertion element is of the same order of magnitude as the width of a panel fitted in the ground. The insertion element preferably has remote-controlled blocking means (14) near its bottom edge, for blocking the means by which the panel can be connected to the insertion element.

Fig-1



EP 0 494 097 A1

The invention relates to a device for inserting an essentially vertical screen into a trench dug in the ground and filled with a mixture such as a bentonite-water mixture or a bentonite-cement-water mixture, which screen is composed of sheeting panels which are interconnected by means of lock parts provided at their vertical side edges, which device has an insertion element with a width corresponding approximately to the width of a panel, and has means by which it can be connected to the edge of each panel to be placed in the bottom of the trench, in such a way that the panel concerned can be pulled into the trench under the influence of the weight of the insertion element.

Such a device is known from Dutch Application NL-A-8,901,419 or German Application DE-A-3,540,270. In the case of these known devices the insertion element is in the form of a press-in plate of which the height measurement corresponds approximately to the height measurement of a panel fitted in the ground.

These known devices have a number of disadvantages. The first disadvantage which can be mentioned is that, given the large surface area measurements of the insertion plate, the device is quite sensitive as regards wind. The forces exerted by the wind on the press-in plate can lead to the press-in plate carrying out uncontrolled movements. The wall of the trench in which the screen is to be fitted can consequently be damaged, while the panels themselves, which are made of relatively thin plastic, can easily be damaged. The same applies to the lock parts by which the panels are interconnected. Given the fact that the latter have to interact in a liquid-proof manner, these lock parts must not therefore become too greatly deformed.

On account of the great height measurement of the known press-in plates, they are also difficult to control during lowering into the trench. As soon as such a press-in plate goes askew, for example because it has become jammed, its great mass and great mass inertia very soon cause too great stresses in the lock connection. This can be prevented only if quick action is taken. There is, however, a great chance of the crane driver's reaction coming too late and of the lock connection being already damaged before he has the chance of moving back the bulky press-in plate.

An attempt was made in DE-A-3,540,270 to offer a solution to this problem by guiding a downward moving press-in plate by an additional press-in plate inserted beforehand. Such a method is cumbersome and relatively expensive.

Finally, it must be remembered that the whole press-in plate is immersed in the mixture in the trench and is subsequently withdrawn from it again with a view to fitting the next panel. This means that considerable quantities of the mixture drip off the press-in plate and can fall beside the trench onto the parts of the device there. This also involves disadvantages for the operating personnel.

On the other hand, it is known from British Patent Application GB-A-2,136,861 to provide the bottom edge of each panel with its own weight. In addition, an auxiliary weight can be fitted at the bottom edge.

Said auxiliary weight rests on hooks provided on said bottom edge and forms an addition to a weight fixed to that panel. After the panel has been positioned in the correct manner, the auxiliary weight can be removed.

This known device also has a number of disadvantages. First of all, the auxiliary weight rests under the influence of gravity on a number of hooks fixed to the bottom of the panel. When the panel is pulled downwards into the trench there is a risk of the auxiliary weight falling out of the hooks, for example as a result of collisions with the trench wall. In addition, each panel must also be provided on the bottom side with its own weight and hooks for the auxiliary weight, which incurs additional work and costs. Finally, the weights provide no sort of guide whatsoever when the panel is being inserted.

In this connection it is also known from American Patent US-A-4,927,297 to insert a double length of sheeting into a trench by means of a set of weights. Apart from the fact that these weights are accommodated loose in the fold of the double sheet, these weights again do not provide any guide whatsoever. On the contrary, owing to their shape, they could even jam in the trench should they go askew.

The object of the invention is therefore to provide a device of the above-mentioned type which does not have these disadvantages. This is achieved in that the height of the insertion element is of the same order of magnitude as the width of a panel fitted in the ground. Such an insertion element is far less sensitive as regards the wind than the press-in plate known from NL-A-8,901,419 or DE-A-3,540,270, as a result of which its movements can be controlled much better. This means that in the case of such an insertion element the risk of the occurrence of damage to the trench and the panels is considerably smaller. The amount of mixture adhering to the insertion element is also much smaller than in the case of the known press-in plate. On the other hand, the press-in element according to the invention still provides a guiding action, with the result that the insertion of the panel is facilitated compared with the weights used in GB-A-2,136,861 or US-A-4,927,297. The insertion element according to the invention can be, for example, just as high as it is wide or, for example,

twice as high as it is wide.

Thanks to the dimensions of the insertion element, the device according to the invention has the advantage of a good guidance of the screen in the trench. This advantage is seen first of all in the avoidance of hitches during lowering into the trench. The height of the insertion element is such that it cannot dig into the trench wall or jam as a result of going out of alignment. On the other hand, the insertion element is readily controllable as a result of its dimensions, and is not sensitive to wind influences. The insertion element can also adapt better to the position of the panels, so that the locks of the panels are not overloaded during the insertion. It is also possible to work with the insertion element according to the invention where there is a different shape of trench, for example as a result of non-vertical walls.

As already mentioned, the panel has to be pulled into the trench under the influence of gravity acting on the insertion element. In view of the fairly small dimensions of the insertion element, and its consequent fairly low weight, the panel must be introduced in such a way that excessive friction forces acting against the driving force do not occur here. According to a preferred embodiment of the invention, supporting means for a rolled-up sheeting panel are provided for this purpose, which supporting means have a supporting surface with a low coefficient of friction for unrolling the roll of sheeting panel on said supporting surface, and for feeding it to the trench. In the case of the known device the panel is fed from a so-called humpback, where the whole panel surface is in friction contact with a supporting surface. In the process relatively great friction forces occur while, on the other hand, in the case of the supporting means according to the invention a considerably lower friction force occurs.

The invention also relates to an insertion element for the device described above, which insertion element has remote-controlled blocking means near its bottom edge, for blocking the means by which the panel can be connected to the insertion element. In this way the insertion element can be detached and raised out of the trench as soon as the panel has reached the bottom of the trench with its bottom edge.

For this purpose, the insertion element can be provided with a strip which can be inserted into an undercut slot of a ground anchor for a panel with a thickened bottom edge, in such a way that the bottom edge of the panel is held in place in the slot when the strip of the insertion element is also in it, the blocking means blocking the insertion element and preventing the strip from moving out of the slot. The use of a ground anchor with an undercut slot, which ground anchor can interact in the above-mentioned manner, is described in Dutch Patent Applications 9,000,874 and 9,000,875, which are not prior publications.

The blocking means by means of which the insertion element is prevented from being removed from the slot can be designed in various ways. According to a preferred embodiment, provision is made for at least one hook which is movable between a position in which it grips round the ground anchor in the position in which the strip of the insertion element is inserted in the slot of the ground anchor and a position in which it releases the ground anchor in such a way that the strip can be removed from the slot of the ground anchor.

Each hook can in this case be pivotable about an axis running parallel to the breadthwise direction of the insertion element and be operable by means of a hydraulic jack which holds each hook in the blocking position, pressed in against a spring force, and on removal of the hydraulic operating pressure is pressed in as a result of the spring force, in such a way that each hook is moved towards the release position. The jack can be operated by means of hydraulic supply lines running towards the ground surface.

The insertion element preferably used is a rectangular frame composed of round pipe and provided at one short side with suspension means for suspending the frame from a hoisting crane, and at the opposite short side with the strip and the hooks. An insertion element in the form of such a frame has a relatively small frontal surface, and is thereby even less sensitive as regards wind. Since the pipes from which the rectangular frame is made are round, the risk of the frame causing damage in trench or panel is also very small.

In order to provide the insertion element with the desired weight, supporting bars can extend between the edges thereof, on which supporting bars ballast elements are provided.

According to a further possibility, the insertion element has at least one floating element which can be fixed to the frame, in such a way that the centre of gravity of the whole insertion element is below the floating element. The press-in force exerted by the insertion element on a screen can be further regulated by means of such a floating element. In addition, this floating element has a stabilising effect on the insertion element immersed in the bentonite suspension, which further promotes the correct handling of the screens to be inserted.

The invention also relates to a supporting table for supporting a rolled-up sheeting panel, which supporting table has a supporting surface which is hollow curved in one direction and has roller means of which the roller axis in each case runs parallel to the generating line of the hollow curved supporting

surface, which supporting surface has at one edge a stripping roller and a discharge roller for correctly unrolling and discharging the panel over said edge into the trench. The roller means can comprise, for example, rings or annular lengths of pipe which are fitted around axes extending parallel to the generating line.

Finally, the invention relates to a method for fitting a screen in the ground by means of the device, the insertion element and the supporting table described above, in which a clamp is fixed to the last panel inserted into the ground, with which an upward directed force can be exerted on said panel, a following panel is then coupled by its lock part to the corresponding lock part of the last panel inserted into the ground, and the panel to be inserted into the ground is pulled into the trench by the insertion element, while an upward force is constantly exerted on the last panel inserted into the ground, in such a way that this panel is not pulled further downwards into the trench. In this way the downward force exerted by the panel to be inserted on the previous panel is prevented from causing the latter to fall over or be pressed further into the ground. Such a state of affairs is advantageous particularly in the case of long panels, where as a panel is placed further into the ground the friction forces in the lock parts constantly increase.

The invention will be explained in greater detail below with reference to an example of an embodiment shown in the figures.

Figure 1 shows a view of a trench with panels containing the device according to the invention.

Figure 2 shows a cross-section through the trench with the device according to the invention.

Figure 3 shows a detail of the device according to the invention relating to the insertion element.

In Fig. 1 a trench wall is indicated by 1, and the panels fitted in the ground are indicated by 2. The panels 2 are interconnected by lock parts 3 which are not shown in any further detail. They can be, for example, a male and a female lock part.

As shown in Figure 1, panel 4 is just being inserted into the ground. For the sake of clarity, the insertion element, indicated in its entirety by 5, is shown by dashed lines. The panel 4 interacts by means of the lock parts 3 with the last panel 2 fitted in the ground. This last panel 2 fitted in the ground is held in place at its top edge close to the relevant lock part 3b by means of a clamp 6 which is suspended from the hoisting crane. By means of the clamp 6 an upward force can be exerted on the last panel 2 fitted in the ground. In this way the panel 2 last fitted in the ground can be prevented from sliding along with panel 4 or falling over as a result of the insertion of the latter panel. The clamp 6 is suspended from a cable 7 connected to the hoisting crane, and the insertion element 5 is also suspended from a cable 8 connected to a hoisting crane.

Figure 2 shows the device with a panel 2 fully fitted in the trench. The insertion element 5 also lies in the bottom of the trench and is about to be detached from the ground anchor 9 which is fixed at the bottom of the panel 2.

As further shown in Figure 2, and also in Figure 1, a supporting means 10 is provided for the roll of panel material 11. The supporting means 10 has a supporting surface comprising rollers 12a, the central axes of which extend parallel to the generating lines of the supporting surface of supporting means 10. A roller 12b which is vertically adjustable is provided at the edge of the supporting means 10 facing the trench, which roller can serve as a stripper for correctly unrolling the panel material 11, and a roller 12c over which the panel 2 can be fed to the trench is provided. The fact that the trench is virtually completely filled with a liquid mixture is not shown.

The ground anchor 9 is shown by dotted lines in Figure 3. As also shown in Figure 2, said ground anchor has a section with undercut slot 25, and also projecting anchor lips 26. A thickened part 27 which fits into the undercut slot of the section 25 is provided on the bottom edge of the panel 2. A strip 13 which is fixed to the underside of the insertion element is also inserted into the undercut slot. It is possible with this strip to prevent the thickened lower edge 27 of the panel 2 from coming out of the undercut slot of the section 25 again. Hooks 14 are provided in order to prevent the strip 13 from coming out of the section 25 during the course of inserting the insertion element together with the panel 2 in the bottom of the trench 1. These hooks are each hinged about a pin 15 running in the breadthwise direction of the insertion element 5, and are interconnected by a rod 16. One of the hooks 14 is provided with a lever 17, to the free end of which a jack 18 is coupled. This jack 18 can be operated by means of supply lines (not shown) with a hydraulic and/or pneumatic medium. The piston rod 19 of the jack 18 runs through an eye 20, which is fixed to a supporting bar 21 of the insertion element 5. A ring 22 is also firmly fixed on the piston rod, and a spring 23 extends between ring 22 and eye 20. This spring 23 tries constantly to press in the piston rod, and therefore to push the hooks 14 into their open position. In the situation shown in Figure 3 the hooks 14 are pressed by the jack 18 into the blocked position, in which they grip under the ground anchor 9. In this position the strip 13 cannot come out of the section 25, so that a bottom edge 27 of a panel in the undercut slot of the section 25 cannot come out.

In the position shown in Figure 2 the hooks 14 are, however, in their release position. For the

hooks 14 are fitted at the position of the recesses 24 in the ground anchor, so that in the position shown in Figure 2 the insertion element can be pulled freely by means of cable 8 out of the section 25. The panel and the ground anchor 9 in this case remain behind in the trench, in such a way that the insertion element can subsequently be used to place the next panel in the trench.

The insertion element 5 also has guide strips 28, which ensure good guidance of the insertion element relative to the trench wall.

Claims

1. Device for inserting an essentially vertical screen into a trench dug in the ground and filled with a mixture such as a bentonite-water mixture or a bentonite-cement-water mixture, which screen is composed of sheeting panels (2) which are interconnected by means of lock parts provided at their vertical side edges, which device has an insertion element (5) with a width corresponding approximately to the width of a panel (2), and has means (25) by which it can be connected to the edge (27) of each panel (2) to be placed in the bottom of the trench, in such a way that the panel (2) concerned can be pulled into the trench under the influence of the weight of the insertion element (3), characterised in that the height of the insertion element (5) is of the same order of magnitude as the width of a panel (2) fitted in the ground.

2. Device according to Claim 1, in which supporting means (10) for a rolled-up sheeting panel are provided, which supporting means (10) have a supporting surface (12a) with a low coefficient of friction for unrolling the roll of sheeting panel (11) on said supporting surface, and for feeding (12b, 12c) it to the trench.

3. Insertion element for a device according to any of the preceding claims, in which the insertion element has remote-controlled blocking means near its bottom edge, for blocking the means by which the panel can be connected to the insertion element.

4. Insertion element according to Claim 3, provided with a strip which can be inserted into an undercut slot of a ground anchor for a panel with a thickened bottom edge, in such a way that the bottom edge of the panel is held in place in the slot when the strip of the insertion element is also in it, the blocking means blocking the insertion element and preventing the strip from moving out of the slot.

5. Insertion element according to Claim 4, in which provision is made for at least one hook which is movable between a position in which it grips round the ground anchor in the position in which the strip of the insertion element is inserted in the slot of the ground anchor and a position in which it releases the ground anchor in such a way that the strip can be moved out of the slot.

6. Insertion element according to Claim 5, in which each hook is pivotable about an axis running parallel to the breadthwise direction of the insertion element and is operable by means of a hydraulic and/or pneumatic jack which holds each hook in the blocking position, pressed in against a spring force, and on removal of the hydraulic operating pressure is pressed in as a result of the spring force, in such a way that each hook is moved towards the release position.

7. Insertion element according to any of the preceding Claims 3 to 6, in which a rectangular frame composed of round pipe is provided, said frame having at one short side suspension means for suspending the frame from a hoisting crane, and at the opposite short side the strip and the hooks.

8. Insertion element according to Claim 7, in which supporting bars extend between the edges of the frame, on which supporting bars ballast elements are mounted.

9. Insertion element according to any of the preceding Claims 3 to 8, in which guide strips are provided at the side facing away from the side where the panel can be fitted, in such a way that the measurement of the insertion element at right angles to the panel is a little smaller than the width of the trench.

10. Insertion element according to Claim 8 or 9, in which at least one floating element can be fixed on the frame, in such a way that the centre of gravity of the whole insertion element is below the floating element.

11. Supporting table for supporting a rolled-up sheeting panel according to Claim 2, in which provision is made for a supporting surface which is curved hollow in one direction and has roller means of which the roller axis in each case runs parallel to the generating lines of the hollow curved supporting surface, which supporting surface has at one edge a vertically adjustable stripping roller for correctly unrolling

the roll of sheeting panel and a discharge roller for discharging the panel over said edge into the trench.

12. Method for fitting a screen in the ground by means of the device, the insertion element and the supporting table according to one of the preceding claims, in which a clamp is fixed to the last panel inserted into the ground, with which an upward directed force can be exerted on said panel, a following panel is then coupled by its lock part to the corresponding lock part of the last panel inserted into the ground, and the panel to be inserted into the ground is pulled into the trench by the insertion element, while an upward force is constantly exerted on the last panel inserted into the ground, in such a way that this panel is not pulled further into the trench.

fig-1

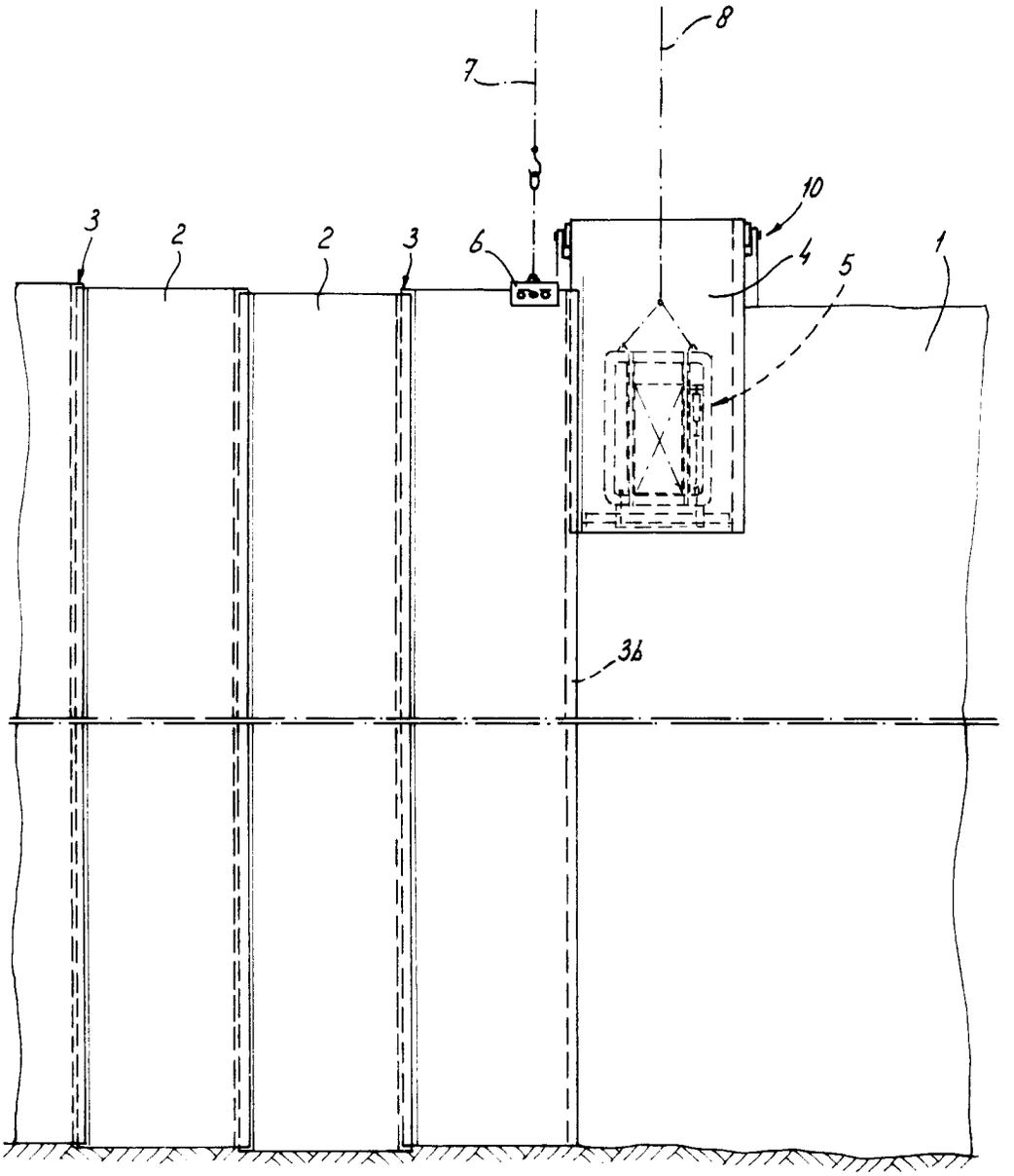


fig - 2

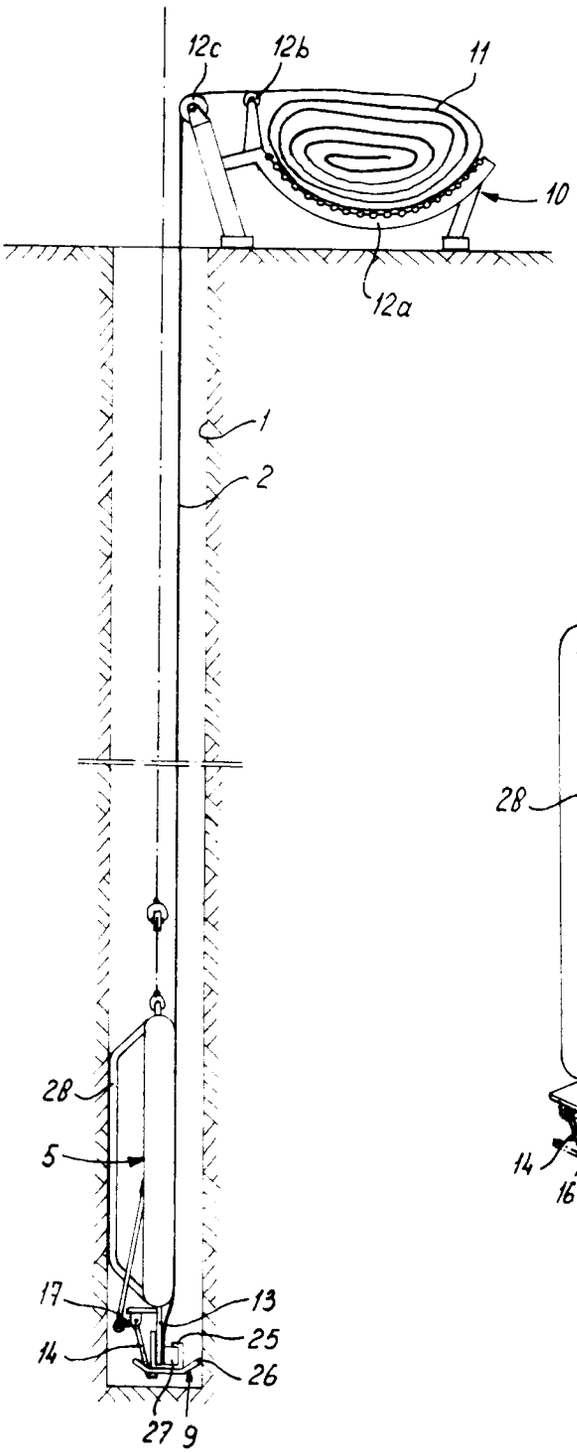
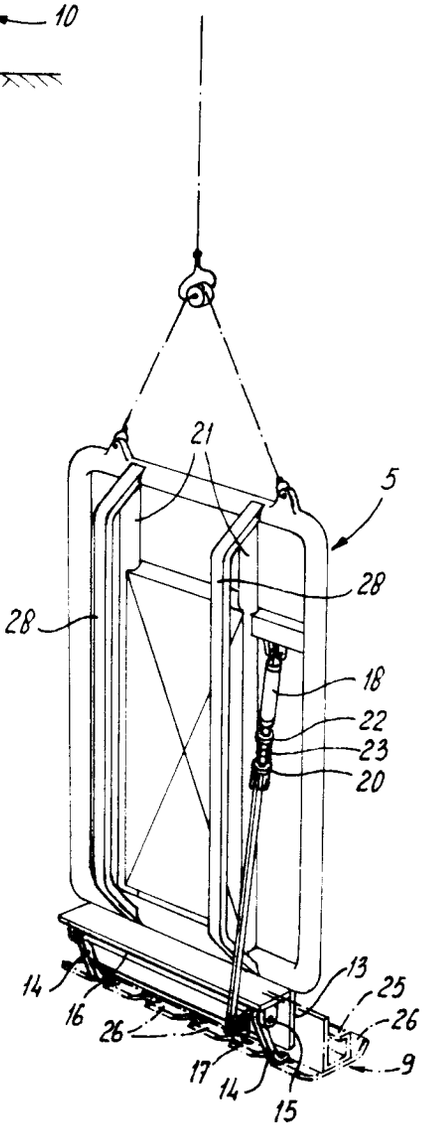

12c
12b
11
10
12a
1
2
28
5
17
13
14
25
26
27
9

fig - 3


21
5
28
28
18
22
23
20
13
25
14
16
26
26
17
14
9
15

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 92 20 0019

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.5)
D,Y D,A	DE-A-3 540 270 (WAYSS&FREYTAG) * column 5, line 64 - column 6, line 34 * * column 7, line 10 - line 37; figures 1-5,11,12 * ---	1,3 12	E02D19/18
D,Y	US-A-4 927 297 (SIMPSON) * column 3, line 29 - line 51; figure 5 * ---	1,3	
A	PATENT ABSTRACTS OF JAPAN vol. 8, no. 284 (M-348)(1721) 26 December 1984 & JP-A-59 150 829 (TAKENAKA DOBOKU) 29 August 1984 * the whole document * ---	2,11	
A,D	NL-A-8 901 419 (HOLLANDSCHE BETON GROEP) * page 4, line 17 - page 5, line 9; figures 2,7 * ---	4	
A	BE-A-905 464 (HERBOSCH-KIERE) -----		

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

E02D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	13 APRIL 1992	kergueno

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 03.82 (P0401)